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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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BRIEFLY TOLD.

MR. ROBERT YOUNG RETIRES.—With pride—although tempered by sadness—we report the resignation of Mr. Robert Young, who, on the 15th inst., retired from the position of General Manager of the Consolidated Gas Company, of Pittsburgh, Pa. We say "pride tempered by sadness" was our thought on hearing that the veteran was to sever positively active service with the gas supply of Pittsburgh and Allegheny, in which field he had performed yeoman's service for a period well over two score years continuously. And why should we all not be proud of a man the closest scanning of whose record only the clearer brings out his ability and integrity and usefulness to his employers and to his profession? And the sadness about it is that he will not be the active Robert as of yore. However, even here we have some cause for congratulation, for his Directors insisted that he remain on the staff as the Company's consulting engineer. On his retirement Mr. Young was presented with a magnificent loving cup by his confreres, whose love and allegiance were of the truest sort. The cup bears this inscription:

To
ROBERT YOUNG,
from
His business Associates and Friends
November, 1906,
In recognition of the merit of more than 40 years' continuous service in the artificial gas business in the Cities of Allegheny and Pittsburgh:
And in appreciation of his worth as a Man.
"And there's a hand, my trusty fiere,
And gie's a hand o' thine.
And we'll tak a right guid willie waught,
For auld lang syne."

Mr. Young's successor as General Manager of the Company is Mr. Joseph F. Guffey. Mr. Orlando M. McElroy, son of Mr. John McElroy, for many years connected with the Pittsburgh Gas Company, has been elected Assistant General Manager.

CURRENT COMMENT.—

THE Queens Borough Gas and Electric Company, Rockaway Park, L. I., has awarded a contract to the Gas Machinery Company, of Cleveland, O., for the installation of a 10-foot water gas set, complete.

THE Board of Extension Teaching, of Columbia University, N. Y., announces a series of 9 evening technical courses which will be given this winter at the University, beginning the 3d prox., and lasting 20 weeks. The courses are under the immediate direction of Prof. Walter Rautenstrauch, of the Faculty of Applied Science, and are to be given by professors and instructors of the University and other persons especially qualified. Moderate fees—ranging from $7.50 to $15—are charged, and most of the courses are for two evenings each week. The courses are as follows: "Engineering Physics," Elementary Mathematics," "Drafting," "Strength of Materials," "Machine Design," "Structural Design," "Electrical Engineering," "Steam Engineering," and "Special Engineering Problems." A complete catalogue of these courses will be sent on request by addressing "Evening Technical Courses, Extension Teaching," Columbia University, City. Personal information may be secured Tuesday and Thursday evenings, between

7:30 and 9 o'clock, from Mr. Benjamin R Andrews, Room 111, Teachers' College. The attention of those interested in the work of the Educational Class of the American Gas Institute is especially called to this opportunity.

WE are indebted to Mr. F. A. Clement, of Bellingham, Wash., for the information that in the case of the Whatcom County Railway and Light Company vs. The City of Bellingham, which was an action brought by the company to compel payment for gas used on the north side of the city in excess of 100,000 cubic feet was decided against the city. Judge Notter ruled, "I am agreed, on statement of facts, that the city had no right to use gas provided free under the Fairhaven charter on the north side. In other words, the charter provisions remain in force as before consolidation, and that while the city can, as before consolidation, use 100,000 feet of gas free of cost annually under the Fairhaven charter, it must be used in Fairhaven, and that while the city may use 100,000 feet of free gas on the north side under the Whatcom charter, the city is not entitled to an excess of 100,000 feet of free gas on either the north side or on the south side, even if a less quantity is used in one part of the city, by reason of the consolidation of the two cities. Messers. Newman & Howard appeared for the Company, and Beach for the city. Under this decision the city will have to pay up its gas bill."

"A FAREWELL banquet was tendered on the night of the 13th inst. by the employers of the Pueblo (Cal.) Gas Company's office staff to Mr. G. E. Legler, the advertising manager, who left next day for Cincinnati, O., where he will have the position of advertising manager of the Cincinnati Gas and Electric Company. Amongst those present were Frank W. Freauff, General Manager of the Denver Gas and Electric Company and Vice-President of the Pueblo Company. Arthur N. Cantril, Manager of the Pueblo Gas Company, acted as toastmaster, and most of those present responded wittily and merrily. The commercial department presented Mr. Legler with a beautiful gold-headed umbrella. At the conclusion of the banquet the balance of the evening was spent with music and social conversation. Mr. Legler came here about six months ago from Madison, Wis., and has made many friends here by his courteous manner, and his ability has been fully appreciated by his employers, who are now putting him at work in a field of vastly larger proportions than the Pueblo one.—S. G. W."

THE Sea Isle City (N. J.) Gas Company has been incorporated by Messrs. Jno. W. Crouse, A. C. Rice, Edw. Buck, Thos. Donovan and others.

CARLSBAD, N. M., recently voted to grant the franchise for a gas plant asked for by Mr. A. J. Muzzy and associates. The same concern was responsible for the construction of the Carlsbad water works.

DURING the recent heavy storm in Washington, the Walla Walla district perhaps suffered the most. The electric lighting plant, which was located on the Walla Walla river was flooded and the service cut out, but fortunately the gas plant was enabled to keep light in the city."

THE Norwood (Mass.) Gas Light Company has arranged to extend its main system to and through the outlying district of Needham.

IT is said that the Iron Mountain (Mich.) Electric Light Company will construct a gas plant there unless work under the franchise granted to the Glass syndicate, of Detroit, Mich., is speedily put underway.

THE following notice, which was issued by the ruling court on the 20th inst., explains itself, it concerns the suit brought by Mr. George W. Pepper, as Receiver of the Bay State Gas Company, against Henry H. Rogers: "Moorfield Storey, Esq., having explained to the court doubts whether he can serve as master, and expressing on account thereof his preference to be relieved from his appointment as such, and the parties having agreed thereto, John C. Gray, Esq., is appointed master in lieu of Mr. Storey, with all the duties and powers according to the interlocutory decree entered on the 18th day of July, 1906; and, Mr. Gray having accepted such appointment, certified copies of said interlocutory decree and the opinion accompanying the same and this order shall stand as his commission as such master."

IN order to aid the public to obtain an understanding of the policy of the State toward lighting companies, and the relation of municipally owned companies to the public, the Massachusetts Board of Gas and Electric Light Commissioners is preparing for publication a small pamphlet giving in systematic and well-indexed form the laws now in force relating to all phases of gas and electric illumination. The brochure also carries precise information respecting the sliding scale policy which governs the operation of the Boston Consolidated Gas Company.

[AS FURNISHED BY THE OFFICIAL STENOGRAPHER.—Continued from page 891.]

PROCEEDINGS, FIRST ANNUAL MEETING, THE AMERICAN GAS INSTITUTE.

HELD IN THE AUDITORIUM HOTEL, CHICAGO, ILLS., OCTOBER 17, 18 AND 19, 1906.

FIRST DAY—AFTERNOON SESSION.

The President—Will Mr. Mitchell kindly take the Chair?

Mr. K. M. Mitchell assumed the Chair, and said: Gentlemen, next in order of business is the report of the Committee on

THE MAKING OF RATES AND THE ADDITIONAL SYSTEM OF COSTS,

which is presented on behalf of the Western Gas Association.

Mr. W. H. Gardiner, Jr.—Mr. President, here is the report of the Committee on Rates, etc., appointed at the last meeting of the Western Gas Association, the committee consisting of Mr. Doherty, Mr. George McLean and myself. I would like to preface the reading of this brief report by saying that in preparing this material we felt obliged to depart from past methods and to treat the subject primarily in an abstract way, confining ourselves to laying down what seemed to us perhaps the best lines for subsequent detailed elaboration rather than to attempt in one report to adequately cover the subject in general, especially in view of the fact that the committee was appointed but 6 months ago. We have not attempted the formulation of any final conclusions on this very intricate subject.

Mr. Gardiner read as follows:

The first action of your committee was to collect a bibliography of 215 references on the subject of rates, prices and costs. This bibliography is appended and is the result of correspondence with the Secretaries of 20 gas associations, 33 electrical associations, 3 gas and electric associations, the editors of 3 technical journals and 6 individuals. The committee would here express its great obligation to these many gentlemen, who, by their hearty co-operation, have enabled your committee to present this valuable bibliography. The committee earnestly requests those who may note omissions from this list to advise the Secretary of the American Gas Institute thereof, to the end that this list may become a complete reference to the principles and methods of public lighting rates. The investigation to date has been confined to the United States, Canada, Great Britain and Ireland, but may be extended to other countries should it be deemed expedient so to do.

Method of Procedure.—Considering this as an initial report your committee deems it its duty to consist in an endeavor to inaugurate steps to an ultimate solution of this great problem, in the light of the large amount of very valuable but disconnected work done by others. Its object is to formulate that rate system which will give the public the maximum public lighting service at the minimum cost to the public and at the same time return to the company a net profit commensurate with the service rendered. This rate should be equitable to all concerned. It should be reasonable, simple and popular. It should be legal under the law, and in the light of such opinions as might reasonably be expected from a true understanding of rates by the courts.

Such specifications may on their face seem contradictory, but your committee's method is not at the outset to affirm or deny what is possible or impossible. Its object is rather to first formulate that rate system which will best serve the public and the company, solely from the economic or monetary standpoint, to formulate the best business getting rate. If this can be produced, it will then be time to say how it must be modified to conform to other exigencies. But if all factors are always simultaneously considered, their individual perfection is impossible and, therefore, none of them can ever be truly balanced so that the product be as good as possible.

For these reasons your committee has set itself against the immediate consideration of the many present forms of gas rates with their many items, as meter charges, uniform rates, customer charges, demand charges, etc. These are the compromises arrived at to date. They are attempts to solve the rate problem under specific conditions, but do not necessarily pertain to its principles.

These principles are so intricate that to consider them collectively would perhaps but confuse the issue. Therefore, your committee recommends that the problem be studied under four separate headings as follows:

1 *Economic Desirability.*—Those rate principles and conditions which, apart from any other considerations, will give the public the maximum service at the lowest price compatible with commensurate net earnings to the company.

2. *Equity.*—Those principles which constitute true equity individually and collectively to all concerned.

3. *Sociological Expediency.*—Those public conditions to which economics and equity must be subordinated.

4. *Legality.*

It is the hope of the committee that, when the principles and practice of rates shall have been considered under these headings, *separatim et seriatim*, a product may be evolved which will have some degree of acceptability and permanency.

Setting aside, therefore, the three last mentioned items for possible future consideration, the committee has proceeded to a preliminary consideration of the first.

Economic Desirability.—The problem is, first, to determine solely those principles under which a rate can be developed that will enable the public to obtain the maximum service from a public lighting company on terms fair to the latter; and, second, to state the conditions and terms of such a rate.

Assuming on the part of the seller the ability to produce, deliver and sell commodities or services, and on the part of the buyer the desire for commodities or services and the ability to pay for them, there are two balancing factors of equal importance in the determining of the ratio of exchange, price or rate, as we call it.

These are, first: The total gross, individual, or average cost to the seller; second, the total value or worth to the buyer of the specific service or commodity as limited by his desire for it in view of other means of obtaining equivalent commodities or services to meet the same ends.

In order to be in some degree mutually profitable the rate of an exchange must in the ultimate lie between these limits, at least on the average. In order to be equally profitable to both parties to the trade it should lie half way between the cost to the seller and the value to the buyer. Therefore, in order to arrive at such a rate, as specified, not only must the cost of the service be determined, but also its value to the community, as limited by other more expensive means to the same ends, such as a municipal lighting plant.

With this theorem as a basis, it becomes obvious that such a rate system as is sought would obtain revenue as follows: It would charge each customer or for each unit of service no more than the price at which equivalent service could be obtained. It would not charge for any service less than the net additional cost of performing it. Between these limits it would charge at such rates as to meet in each case the individual costs occasioned by each and every individual item of service, but in such a way that the total costs of rendering the service be met in full and a net gain be shown the company equal to the saving the service effected for the customer or customers over the costs of otherwise obtaining equivalent service.

This involves several separate lines of procedure as follows:

1. A conclusive analysis and statement of all items of all costs.
2. A parallel statement of the value of the service.
3. The balancing of the collective and individual costs and values in such a manner as to produce the desired result.

Your committee appreciates the great value of much of the work done in the past on methods of accounting, and especially the more recent and novel work done in connection with new methods of cost-finding in the industrial as well as in the public service fields.

A review on their part of some of this work led to the conclusion that, like attempts to solve the rate problem, much of it has been in the nature of an endeavor to expound and advance special and individual methods rather than to correlate and solve a final system. Your committee, therefore, earnestly recommends that, before any other steps are taken toward a solution of the rate problem, thorough and, if possible, conclusive work be carried out to determine the true economic factors of cost in the gas business and their interrelations and relative importance. The members of your committee sincerely hope that they or another committee will be intrusted with this work to the end that the programme suggested in this report may be carried out with such modifications as may be suggested.

Every member of the committee deeply regrets that in this, their initial report, they have been unable to come to any more advanced or final conclusions. They would, however, express their opinions as individuals that the rate problem cannot be solved by the simple method of dividing costs by sales and arbitrarily adding a supposedly fair average profit. They furthermore express the hope that the present rapid growth of differential rates, as alternatives or successors to the primitive and pernicious uniform rate by meter, will continue.

In conclusion, we would say that, while this report may not seem definite, we have clearly in mind the principal steps to take to evolve that rate system which will equably, expediently and legally give the public the maximum service as cheaply as possible with a fair return to the company.

Respectfully submitted,

W. H. GARDINER, JR.,
HENRY L. DOHERTY,
GEORGE MCLEAN,
} Committee.

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Mr. Gardiner, in conclusion, then said: When this work was undertaken I opened up correspondence with the secretaries of all of the gas and electrical associations of this country and Great Britain and Ireland, and I here wish to acknowledge the hearty co-operation that I received in the work, both in this country and in England, notably so, for instance, from Mr. Helps, of Croydon, who wrote me a 10 or 15-page letter, which was a very valuable contribution indeed on the general rate situation in England. I mention his among many valuable contributions from England, merely because his name happened to come first to my mind. Many of these gentlemen, in answering requests for papers and information on rates, have asked that a copy of the report be sent them when it is published, simply for the bibliography contained therein. The bibliographic part of the report contains some 215 references to rates and a large number of references to legal opinions and decisions on the rate question.

Discussion.

The President—You have heard the reading of this report. As it is a very valuable contribution to our work, we would be glad to have as free a discussion on this most important subject as possible. We would be glad to hear from the other members of the committee.

PUBLIC POLICY COMMITTEE.

Mr. D. McDonald—It is suggested that this matter be left to the committee. It seems to me it brings up the whole question of the relation of the gas company to the public and to the authorities, because when you come to fixing rates you find that you are hedged around with legal restrictions, sometimes with constitutional restrictions. I, therefore, make a motion for the appointment of a committee, and for the reference of this paper or this subject to that committee. I make the motion in this form, Mr. President: That the incoming President of this Institute be requested to appoint a committee of 7 members to be known as the "Public Policy Committee," and to be charged with the consideration of all matters relating to the relations of gas companies to their patrons and to the public authorities. [Seconded.]

Mr. Shelton—It seems to me that that committee is charged with a tremendous undertaking if it is to report on "all questions of public policy;" furthermore, I dislike to see this increase in the number of committees. It seems to me we have about enough of them now, and that we had better try to hold down the number unless we have some specific work for the committees to do. It seems to my mind, Mr. President, that such a committee would of necessity have to work on very general lines, and before any such motion is approved I would like to hear it discussed further in the attempt to have information given us as to what it is specifically proposed to have the committee do.

Mr. D. McDonald—In answer to that, Mr. President, I have to say I have used this paper as the occasion and not as the cause of making this motion. In nearly every one of the 50 States the authorities are constantly considering more or less matters which are directly affecting our business. My idea is that this industry ought to have an organization through which it can speak, at least through which it can speak to its own members, and can instruct them as to what is to their interest—an organization that can point out bad laws and point to States which have adopted better ones. If there is any committee or body in this Association which has been given such a duty to perform I will withdraw this motion. If not, then I insist upon it, because I think we should be able to act as a unit and intelligently in regard to many of these matters which are coming up and which are of vital importance to the gas industry.

The President—Gentlemen, you have heard the motion or the resolution offered by Mr. McDonald. Are there any further remarks?

Mr. W. H. Gardiner, Jr.—The question has been raised, as I understand it, as to whether there was a definite, fixed field of action to be left to such committee. It seems to me there most assuredly is, and I would like to mention, as among the subjects which might be spoken of offhand, such topics as taxation, rate regulation and the entire question of government control. These are items of critical and even vital importance to the industry we represent. I think such a committee, if it were a live one, and composed of strong, able, broad-minded men, could work in that field, and theirs would be a work of very great value to the gas industry.

Mr. Shelton—I do not wish to be understood or construed as underrating for one minute the importance of this subject, but by referring "all questions of public policy" to a single committee is certainly going to impose on it a mass of work and responsibility scarcely fair to expect a single committee to cope with. The questions are so diverse that it would require many committees in order to give them adequate consideration, and after all it leads up to the broad question of the work of the Institute. Mr. Gardiner is right in saying that the questions he speaks of are all important ones, which have only been partially met heretofore; but my thought is that a single committee is an insufficient tool to meet all these questions. It comes right back, it seems to me, to a question of policy. We had better settle, first, the ways and means by which the expanding work of the Institute is to be taken care of—or whether it is to be divided into different departments. Among these, one which he mentions would fall into the department of a legal nature. The question of taxes is really of that nature, and that of rates is in the same category. At any rate, before this is voted on, I would like to hear what the duties of that committee are to be, so we can get it a little more clearly in mind.

Mr. McDonald—My point is to have an organization which can have these matters before it, that knows when hostile legislation is proposed. It is not expected that the committee will do any lobbying, but it could point out where a particular law works badly, and suggest where a better law has been passed that worked well, and that is just what the individual gas man living in any city wants to know, so that when a critical time comes he has a resource to fall back on.

Mr. W. H. Gardiner, Jr.—If I may be allowed another word in connection with this committee. I do not know whether Mr. McDonald had in mind a committee who would take up active work outside so much as a committee who would study these questions and formulate them, preparing the work beforehand, foreseeing crises before they arose, and working up the material and means of meeting coming difficulties. That would be the field of work of such a committee, in which field, it seems to me, this proposed committee can undertake such work, and do as much as it is within its power to do within the scope of its work and the time at its command. Personally, I do not have in mind that it was to be a committee to do outside active work, having rather in mind a preparatory or student committee that would think over and formulate these many vital matters of public policy.

Mr. Doherty—I may be able to throw a little light on this, although I do not know that I can. A similar committee exists in an organization with which I am connected that deals with questions concerning corporations interested in quasi public service. Whether this could do the work on the same general lines of this committee of this other organization I refer to I do not know; but this suggests that something should be done in this line for our fellow gas men. In the particular association of which I speak a committee has been formed of 5 or 7 men, I do not remember which. They took men who had a natural interest in a particular line of business, men who they believed had the widest view of the entire country in regard to the relations of the quasi-public corporations to the public, and they expect that committee to anticipate the classes of difficulties which quasi-public corporations may have in their future experience and, by anticipating them or foreseeing them, to prepare for them so they may be met successfully. I urge the appointment of a committee of that sort, and especially that the committee should be in touch with other quasi-public service corporations so that they can work with them.

The President—Mr. McDonald, will you kindly state your motion again?

Mr. D. McDonald—I will read it: "That the incoming President of this Institute be requested to appoint a committee of 7 members, to be known as the 'Public Policy Committee,' this committee to be charged with the consideration of all matters relating to the relations of gas companies to their patrons and to the public authorities."

The President—You have heard the resolution offered by Mr. McDonald. All in favor will signify by saying "Aye." Contrary minds will signify by the usual sign. The "Ayes" have it, and the committee will be appointed.

Mr. Egner—I want to make a suggestion, which should properly be made, perhaps, to the incoming President. I listened with great attention and interest to what Mr. Gardiner said at the Cleveland meeting, and to what he has read here now. I am not joking at all when I say I believe he is the best qualified man to work this matter up that we have before us. I believe he has taken the thing to heart. I do not wish to flatter him at all, but I read his paper presented at the Cleveland meeting, and have listened to what he has said here, and what I have heard here has only confirmed my opinion, that, as it seems to me, he is the best fitted of all I have heard on the subject. The suggestion which I desire to offer is, that Mr. Gardiner be appointed as chairman of a committee to continue this work, and to report at our next meeting; and, as Mr. McDonald has just now suggested to me, that one man alone would not carry so much weight as when others would be associated with him, I believe that if a few men of influence, importance and ability were appointed with him on that committee, we would have something worth while on the subject at our next meeting. If I might suggest, I would propose that such men as Mr. Doherty, Mr. Shelton and Mr. Walton Clark be placed on said committee. These gentlemen would carry weight, and probably refer the work to be done back to Mr. Gardiner; and so it would be all worked out in good shape, and everybody be satisfied in the end. I hope that this suggestion can be acted upon.

The President—The incoming President, Mr. Egner, will certainly read your remarks and will act, I am sure, for the best interest of the Institute.

Mr. A. S. Miller—Mr. Chairman, do I understand that the report was referred to this committee, or has there been any action on the report?

The President—Nothing has been done on the report.

Mr. Miller—Then I move, Mr. President that the report be accepted and the committe continued. [Seconded.]

The President—All in favor of the motion signify by saying "Aye." Contrary minds, "No." It is carried and the report is accepted. I believe, Mr. Secretary, you have a telegram to read.

A Telegram.

San Francisco, Cal., Oct. 17, 1906.

American Gas Institute, Auditorium Hotel, Chicago, Ills.: Congratulations and best wishes. May you live long and prosper.—E. C. Jones.

[To be Continued.]

(Continued from page 895.)

FOURTEENTH ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

Held in San Francisco, Cal., September 18, 19 and 20, 1906.

Second Day—Morning Session.

The meeting was called to order at 11 A.M. The Acting President called for the

Report of the Nominating Committee,

which was read as follows:

To the President and Members of the Pacific Coast Gas Association—Gentlemen: Your Nominating Committee begs to report with the following recommendations:

For President—John Martin, San Francisco.
For Vice-President—C. O. G. Miller, San Francisco.
For Secretary and Treasurer—John A. Britton, San Francisco.
For Directors—Wm. Baurhyte, Los Angeles; John S. Kaneen, San Rafael; Van E. Britton, Santa Cruz; Edward E. Rix, San Francisco.

Your Committee also recommends that the Secretary be empowered to employ an assistant, at a compensation to be fixed by him, and to be paid out of the Treasury of the Association.

Respectfully submitted, E. C. Jones, W. B. Cline, W. F. Boardman, } Committee.

Election of Officers.

The usual form of balloting having been proceeded with, the nominees were duly declared elected, and the recommendation as to salary of assistant secretary having been concurred in, the Acting President called upon Secretary Britton to speak for Mr. Martin over the matter of his re-election.

The Secretary—I may be able to represent Mr. Martin in some particulars, but certainly not in most of his acquirements, either physically and mentally. I will say, on behalf of Mr. Martin, that no one here this afternoou feels more keenly than he the fact that he could not be with us at this time. He would have made any personal sacrifice to have been here; but it was beyond him. He could not escape the necessity for his trip to the East, and I know that he will appreciate the compliment that has been conferred upon him by the Association in electing him for another year. It has been the wish of Mr. Martin's existence, as a gas man, ever since the first day that he came into the Association, 14 years ago, when of his own volition he presented to each charter member of the Association a gold badge which became the insignia of the Association. He was not then a member, but subsequently became one, as you know. When he became a member he was an electric light man, pure and simple, and had little or no use for the gas man; but he has been educated. He is now more of a gas man than an electric light man. Mr. Jones will testify to that better than I can. You have honored a man who is entitled to be honored. No other man in the State of California to-day, and I speak without prejudice, has done as much for the development of both its gas and electric industries as John Martin; and, back in New York as he is to-day, he will receive with delight the telegram which I shall send him, advising him of the very complimentary action of this body. And you can depend upon it that next year he will give you a meeting of which you all will be proud.

Two Telegrams.

The Secretary—I have received the following telegrams, which I will read to the Association:

Tacoma, Wash., Sept. 18, 1906.

Jno. Martin, Pres. Pacific Coast Gas Association, San Francisco:

I make motion that papers be distributed before next meeting. It would tend to more intelligent discussion and encourage diverse expressions. W. A. Aldrich.

John A. Britton, Sec. Pacific Coast Gas Association, San Francisco, Cal.:

Hearty congratulations and best wishes for a bumper. Have just succeeded to management here. Impossible to get away. Put us down for four subscriptions. W. A. Aldrich.

The Acting President—We will now listen to the paper by Mr. Sherwood Grover, of San Francisco, on

EXPERIENCE WITH HIGH PRESSURE GAS MAINS.

High pressure gas distribution, although not very old as applied to artificial gas, is no longer an experiment. When we say high pressure we mean over 2 pounds per square inch. If one picks up a Cox high-pressure, gas-discharge computer and calculates the capacity of various size pipes, at gradually increasing pressures, it is liable to lead the imagination into the realm of the impractical. If, however, at the same time that person has a horse power computer, similar in design, and follows these discharge computations with calculations for cost of compression, he will soon realize that there is an economical limit to the practice of transmitting gas under pressure—*i. e.*, there is a point beyond which, under given conditions of cost for power, materials, labor, etc., it will not pay to raise the pressure, but instead it is time to increase the diameter of the pipe, or, in case of a system already installed, to lay another pipe. This important branch of the subject is, however, treated in a paper at this meeting by the man best able to handle it.

High pressure systems are of two kinds, which fact has been stated in a previous article on the subject. One type in which the high pressure mains are simply feeders in the form of arteries running through a district, with regulators connected here and there to boost up pressure at weak points in the low pressure distributing mains, or they may be in the form of a loop entirely circling a town and feeding in at the dead ends. The other type is where the entire system is high pressure, varying in degree, with regulators reducing the feeding main pressure of 20 pounds or more to a distributing main pressure of 2 to 5 pounds, and this in turn reduced by regulators on each house service. The writer does not favor the second type of installation, although there are conditions under which it works very well, preferring rather low pressure on all distributing mains, not to exceed 12 inch water column, with no high pressure on service pipes. This method allows using a small, and practically uniform, size of pipe for distribution mains in given districts, and is specially adapted to suburban tracts, where consumers are wide apart and main extensions do not pay high returns on investment. It is surprising how many consumers with gas bills ranging from $10 to $25 per month can be supplied by a 2-inch pipe carrying a pressure of 10-inch water column.

A high pressure system can be for convenience considered as consisting of three different parts; namely, the compression plant, the storage plant and the feeding mains.

The Compression Plant.—This includes the compressors, their motive power and piping system. Right at this point there is considerable opportunity for difference of opinion as to motive power, type and size of units employed, and arrangement of units. The first is a local question, depending upon the cost of power, together with reasonable insurance against breakdown or interruption of service. In case electricity is used, it is necessary to have either gas engine or steam engine auxiliary to insure against interrupted service, or else the storage plant must be of sufficient capacity to bridge over any delay which may occur.

Concerning type and size of units, it goes without saying that the most efficient compressors should be used, but there are several little points, such as unloading devices, automatic or otherwise, which have more or less merit, depending on the size of the installation. An automatic unloader is very handy in a small installation, but the writer questions the economy of it in a large installation. All automatic unloaders are virtually by-passes, and by-passing compressed gas means excessive temperature of the compressor and of the gas being compressed. Unloaders of the pattern used on compressors with Corliss valves, by which the machine can be operated at .25, .50, .75 or full load, are very useful. They must, however, be used with judgment, and wear on the compressor be equalized by changing sides when running at part load, so that each part of the machine has the same total number hours' work.

The size of units, of course, depends upon the peak load, unless you are depending on the storage plant to carry you over. Our experience in California has, however, taught us that a unit approximately equal in capacity to the peak hourly send out is none too large, and as it is, of course, necessary to have duplicate apparatus, it is well to have the units of varying capacity, so that by running different units during the day it can be so arranged that they are running at full load, and hence at best economy most of the time.

In arrangement of units the writer believes from observation of several installations that shafting should be entirely avoided, all units being direct connected with their motive power and independent of each other. This on the score of economy in installation and also of operation.

Storage Plant.—This consists of a battery of compression tanks, arranged on a suitable foundation, together with the system of piping and regulators connecting them to the distributing mains.

A standard size and type of tank has been adopted by our Company, which was determined by economy and ease of handling and railroad transportation, together with least cost per 1,000 cubic feet stored. This size is 6 feet in diameter by 30 feet in length, with dished heads. It has one manhole fitted with cover and yoke, one 2-inch reinforced tapped hole, which serves as both inlet and outlet, and one 1-inch reinforced tapped hole, to be used for drip pipe.

These tanks are placed in a row on the foundation, the number depending upon the amount of ground which can be used to best advantage. Other rows may from time to time be added on top of the first, making this installation a flexible one, which can be increased each year at a comparatively small cost to meet the demands of a growing town. One tank, which we call the low pressure tank, differs from the rest in that it is a distributing and not a storage tank, and although it is equipped with a manhole and drip connection, like the storage tanks, it also has extra connections, to which are attached the regulators supplying the different feeding mains of the town.

In large installations it has been found most satisfactory to carry 20 pounds or under on the feeding mains, and hence the main compression units are built for this pressure only. As it is necessary to use 100 pounds pressure (not less than 80 pounds) on our storage tanks, in order to get capacity it, therefore, follows we must have a compressor capable of compressing to 100 pounds. This unit, on account of the nature of its work, can have a very small capacity in comparison to the other machines of the installation, its use being simply to keep the storage tanks full.

The general arrangement of the compression and storage plant is as follows: The discharge from the 20-pound compressors is carried by a single line of pipe to the 20-pound tank, a branch being taken for suction to the small 100-pound compressor, so that it may take gas either at 20 pounds or at holder pressure, as the case may be. The discharge from the 100-pound compressor is carried by a single line of pipe to the storage tanks, a 2-inch connection with valve being made to each tank. This same header is continued to the 20-pound tank and is connected to it through a regulator and by-pass. This regulator is set to maintain a pressure less than 20 pounds—say, for example, 15 pounds—then, as long as there is 20 pounds pressure on the distributing tank, this regulator is shut; but if for any reason the pressure drops, this regulator comes into action and maintains the pressure at 15 pounds, as long as there is anything in excess of this in the storage tanks, or the small compressor is able to keep it up. The various feeding mains of the city are taken directly from the 20-pound tank, with a separate regulator on each, so that any pressure under 20 pounds can be carried on any main independent of the others.

In installing a complete plant of this nature there are many practical points to which attention must be given to avoid trouble. To begin with, the compression tanks must be handled with care to avoid subjecting them to unequal strains, which may cause the seams to leak. It is not an easy matter to make a tank (which has been injured by failure to observe this point) gas tight after it is in place.

The fittings should be selected with greatest care and only smooth, perfect castings used. Porous castings are to the high pressure pipe man what naphthaline is to the complaint man. Extra heavy fittings, both flanged and screwed, should be used throug hout, screwed joints being avoided if possible, and only sockets with taper threads used in straight runs of pipe. The writer favors making everything above 2-inch diameter flanged. Too much care cannot be taken in making up both flange and screwed joints, and although with a perfect thread it is possible to make a tight joint with red lead, "litharge and glycerine" mixture has often been necessary. In flange joints the simplest, cheapest and most satisfactory gasket has been found to be $\frac{3}{16}$-inch lead wire, soldered into rings with nothing else, although red lead is sometimes used with it. For the manholes on the compression tanks $\frac{1}{8}$-inch lead pipe makes a very satisfactory gasket.

After considerable experience with valves it has been found that only extra heavy ammonia valves can be relied upon, and even these at times give trouble. There is one important fact right here which must be remembered, and that is an hydraulic test on a valve or stopcock is absolutely worthless if the fitting is to be used for high pressure gas; both valves and stopcocks of various types have been tested to 250 and 300 pounds water pressure and were tight, but when subjected to air pressure failed to hold over 60 pounds, and some even leaked as low as 30 pounds. Some of the above statements may look queer to an Eastern engineer, but it must be considered that California is a long way from the base of supplies, and the question with us is often "What can we get?" instead of "What is the best to use?"

Feeding Mains.—In the design of this portion of the system there is considerable opportunity to exercise ingenuity, but at the same time there are certain fundamental facts which should not be overlooked. A high pressure feeding main is subject to some of the physical laws which govern the design of a blast pipe supplying a number of sets of water gas apparatus; at the same time it is under some of the physical laws governing steam pipe design.

It naturally follows that all sharp turns should be avoided, using instead easy curves and long sweeps. It is even well to substitute Y-fittings in place of crosses or tees, where branches are taken from the main feeders. For joints the patent couplers, such as those made by the S. R. Dresser Manufacturing Company and Hammond Coupling Company, have been adopted. These, of course, are used with plain end pipe, so that at points where branches are taken from the main feeder, or regulators installed, a change piece is used which has a flange at one end and a coupling on the other. This is made up to the flanged fitting Y, cross or tee, as the case may be, and a valve placed on the branch or branches, so that the testing of the line, which is carried on regularly with the work so that no pipe is covered till tight, need not be interrupted. All work is tested to not less than 100 pounds per square inch. A feeder also ends with a valve.

In laying the line care must be taken to properly anchor and brace all curves or bends. The gyrations of a garden hose, if left to itself with a good head of water on it, will serve to illustrate what will happen if this precaution is neglected.

The regulators are placed in manholes built in the street. They are either of brick or concrete, and each regulator has an inlet and outlet and a by-pass valve. The use of two regulators in parallel is advocated and are in use in some locations. We have found in this climate that 1 extra regulator of each size on hand is a good plan. As the regulators are inspected at regular intervals, trouble can be anticipated and the regulator removed to the repair shop, where proper adjustments can be made while the extra one takes its place. During the change the by-pass is operated.

The matter of drips has caused considerable trouble, but principal

n systems where the entire installation is high pressure or where the feeders are small. A device composed of fittings has been used in some cases, which makes the gas turn at a sharp angle to precipitate its moisture. This works very well on high pressure distribution mains of small installations, but it is not practical in a feeder at all. At first it was deemed sufficient to merely tap the main and blow out the condensation with its own pressure. Experience, however, has shown that this does not always give satisfaction, and it was found necessary to go back to the low pressure gas practice and design a drip-pot with an opening the full size of the pipe, which can be inserted in the line by means of the flange coupling adapting pieces referred to above. If you stop to consider that there is a time of minimum consumption during the 24 hours, when the gas in the mains is almost at rest, the velocity being practically nothing, and that this occurs when the temperature is lowest and hence best for precipitation of moisture, it is apparent that if these drip-pots are placed at the low points they will catch the condensation; then it is an easy matter to blow it out with pressure

Coating of pipe is a subject upon which numerous papers have been written, and it is still unsettled. It is not the province of this article to discuss this point. We paint our pipe, but the materials and methods at present employed are not entirely satisfactory. Too much dependence must not be placed upon the skill and care of the man who does the painting and afterward upon the man who places it in the ground.

Discussion.

Mr. Cope—I would like to ask Mr. Grover if he has any data, or if he has ever found out about the proportion of water that would go into a pressure main per million feet of gas?

Mr. Grover—I have no data on the subject. I have never made any calculations.

Mr. Jones—I think it would depend entirely upon the humidity of the gas, although it might also depend upon the compression. It is possible that the water may be prevented from entering the main system. In relation to Mr. Grover's excellent paper, I want to say a few words. The handwriting on the wall at Belshazzar's feast, "Thou art weighed in the balance and art found wanting," was applied to all cast iron main systems in California by the earthquake of April 18th, and the only thing that saved at all the cast iron mains was the lead joints. Much has been written about the comparative excellence of cement and lead joints for joining cast iron pipes, and the balance has always been in favor of the cement joints on account of its great strength, and while a cement joint is much stronger than an ordinary cast iron gas pipe, where the pipe is drawn apart by the frost, as in Eastern States, the cement joint holds and the pipe is broken back of the bell rather than at the joint; but the argument is only in favor of lead joints in earthquake districts. Lead joints are the only safe ones, notwithstanding the fact that all lead joints leak in a measure. In the Corporation we have nearly 65 miles of high pressure, steel, gas mains. The earthquake of April 18th did not disturb a foot of these steel mains. There was not a broken joint, and the pliability of the pipe is what saved the day. High pressure systems have a great advantage over all low pressure systems in the matter of testing for leaks. If you find it impossible to shut off your consumers for a few moments to test, when there is little consumption, gradually increase the pressure on your system; if you are carrying 25 pounds give it 50 for an hour's time, watch your gauge and you can determine by the drop therein whether there is any change, or much leakage in the mains. Another matter, the provision of initial storage of gas on high pressure systems, under greater pressure than that carried on the mains, is of importance. The wisdom of this has been questioned by some Eastern engineers, and that led us on the Coast to determine whether they or we were right. If you are using a steam engine as a motive power or an electric motor, the current may be cut off, or there may be some mechanical difficulty with either of them, and you are apt to have a stoppage, it may be for 10 seconds or for 10 minutes, but these stoppages in electricity seldom last over 5 or 10 minutes. That is considered a serious breakdown to electricians to-day. If you provide compressors, sending gas into the high pressure mains at a moderate pressure (say 20 to 40 pounds) large enough to carry the peak hour, and then provide in parallel smaller high pressure compressors, to say the limit of the mechanical capacity of first stage compression, about 80 pounds, and let the smaller compressors pump during the day into the pressure tanks, which I would say should amount to as much as 20 per cent. of the peak hour, then you are provided with a storage of gas under high pressure. This should be automatically fed into the lower pressure gas mains by regulators so that it does not depend upon any man's memory to keep the system in gas. Immediately you have an accident and the motor stops, these campression tanks begin to do their work. They feed from 80 pounds to 40 pounds, and bridge over the time that the power is off. This is a most important feature, and is a source of much comfort and satisfaction to the man in charge of the station.

The Acting President—Mr. Jones' remarks were very interesting, and I would lik to hear from Mr. Campbell on this subject.

Mr. Campbell—I think Mr. Jones covered everything I would like to say. I noticed that Mr. Grover mentioned he had to use drips, and I wondered if that was necessary. I have a high pressure system but do not use drips, and I have never had any trouble with it. I carry about 80 pounds on the tanks and 3 pounds on the mains.

Mr. Jones—Mr. Lowe once said a very true thing which I think is worth repeating, because I think it will appeal to you, "When it rains outside, it rains in your gasholder and in your mains." The amount of water in gas depends entirely upon the humidity of the air and gas under atmospheric pressure, with a slightly increased pressure due to the weight of the holder, is practically of the same humidity as the air outside, so that the amount of water in the gas varies from time to time.

Mr. Britton—It might be well to read a little history into this discussion. California and the Pacific Coast Gas Association should take the credit of having been the pioneers of high pressure gas distribution. To it the credit belongs of having men in the Association who worked out all of the problems. While there has been in the Eastern States, among a few companies, a demand for the supply of gas under high pressure, there has not been that concert of action there as in California. It has gone down in history that Oakland was the first city in the world to serve artificial gas under high pressure. It is true, in a crude way. Mr. Eichbaum, one of our senior members, who is here to-day, had something to do with the first installation. That was improved from time to time, until it was taken up by Mr. Jones actively, who solved all of the problems that concern high pressure gas distribution, until to-day it is what you all know it to be. Further than that, in the early days, when experiments were being made with high pressure gas distribution, a certain amount of secrecy was observed. It was thought to be one of the trade secrets of the profession, and those of us who were undertaking high pressure distribution and trying to overcome its difficulties wanted to keep it to ourselves; gradually it has leaked out, until this time the world is getting free, practically, information from men like Mr. Jones, Mr. Rix and Mr. Grover. They have given you facts here to-day covering the costs, practical utility, and the means and methods of high pressure gas, that have been arrived at in the years of our experimenting, which has made it as effective as it is to-day. As Mr. Jones said, I think those of us who have been right in the fight could talk to you all day on that question, involving thoughts that have come to us, and some entirely new ones that we are experimenting on now, which Mr. Jones has in hand, that will cause the scions of the gas world to open wide their eyes, because there are new developments not thought possible in this one question of gas compression and high pressure distribution. I wanted to say this so that it will be read into the record that we are taking to ourselves the credit for all of this work, and the credit of having the men who have been able to handle it. It occurs to me, and I make it a suggestion, that perhaps it might be well in that pamphlet which we are about to issue of Mr. Rix's, to place some excerpts at least, if not the whole paper of Mr. Grover's, on the technical end, following the development of the technical side that has been developed by Mr. Rix.

Mr. Lowe—I can give you a little idea as to the twisting of high pressure gas mains by our own experience at Palo Alto. At the time of the earthquake probably no locality suffered a more severe shock than Palo Alto, Those of you who have seen the condition of the University Buildings, and recognizing the fact that every 2-story brick building in Palo Alto was shaken, know something of it yourself. The line of the fault is about 6 miles from San Francisco, while it is only about 3 miles from Palo Alto, consequently, the shock was very much more severe. We had in Palo Alto something over 12 miles of mains, and something over 500 service pipes. We get our gas from Redwood City, about 5 miles distant. Our plant consists of 4 compression tanks, 12 miles of mains, and 500 services. The Redwood City plant was put out of commission for a few days. The first act of our manager was to close off our services, so that when the gas came on there would be no danger of sending gas into houses which possibly might have suffered to any particular degree. We were anxious to test the mains, and this afforded an admirable opportunity. When the gas was finally turned on from Redwood City, we did not have a single leak of any description. The mains were absolutely tight, notwithstanding tanks, mains.

services, and the entire works stood the very severe disturbance of the earth at that point.

Mr. Britton—The fact that your tanks were not disturbed was that they were buried beneath the ground.

Mr. Newbert—I may state that the high pressure mains between Redwood City and Palo Alto, and also between Redwood City and San Mateo, tested out perfectly after we turned the gas on, and did not show a single leak. It was a splendid opportunity to make the test and we found no leaks in any of our high pressure mains, and, while Mr. Lowe has stated that the plant was damaged, so far as our holder and generating apparatus, our compression tanks and regulator connections were concerned, they were not disturbed in the least.

Mr. Britton—I would like to ask Mr. Jones if that is not true of the gas line we have in Oakland? We have 2 lines in Oakland, a backbone line, through the center of the town, and a line running practically at right angles to it. We also have a line between Santa Rosa and Petaluma, the longest line we have. You all know how effective the disturbance was at Santa Rosa, but there was not a leak or break in any of our lines.

Mr. Jones—I have not had a single leak reported to me on either of these lines. The Santa Rosa-Petaluma line, 17 miles in length, was in operation, and the Oakland lines were tested and showed no leakage. The various high pressure couplings are being improved from time to time, and one of the latest improvements is the substitution of a steel barrel for covering the joint of the 2 pipes. Formerly it was cast iron, but with the use of the steel barrel the joint is as flexible as the pipe. The flanges are so closely drawn that it is utterly impossible for any gas to get near the rubber gasket (excepting a feather edge), to cause it to rot and produce a leak.

Mr. Grover—The actual reason, I believe, is said to be that such a small surface of the rubber is exposed to the gas. Mr. Dresser, who has had a good deal of experience in regard to the life of a coupling, claims to have taken couplings apart after they have been in the ground from 25 to 30 years, and found that the rubber was in good condition. One thing I want to speak about in connection with the earthquake is in connection with our pipe in Oakland that goes across what is known as the 12th street dam in Oakland. It is a concrete culvert through which the water from Lake Merritt runs to the Estuary. Across this dam we have 2 mains, one of 8-inch cast iron, the other a 6-inch high pressure main, laid about 15 feet apart, and both built into the solid masonry. The earthquake broke the Contra Costa Water Company's pipe there and washed out quite a little of the roadway, and broke our 8 inch pipe on both sides of this masonry, the ground sinking down 18 inches to 2 feet. While we were working on the 8 inch main we looked up our high pressure main, and found there was only one place where the road had not fallen, and that was held up by our high pressure main.

Mr. Berkley—What make of regulator do you find most effective?

Mr. Grover—We use entirely the Chaplin-Fulton regulator, except on house services, where we use the Equitable regulator, and in some cases the Johnson-Reynolds.

Mr. Van E. Britton—At Santa Cruz we discovered that our leakage was in the cast iron system, but in the new 2-inch, high pressure system that we have been putting in there was not the slightest disturbance at all, and no leaks. Of course, our own system was broken by the earthquake, and in several places throughout the town the mains were carried out, but in the wrought iron system there were no breakages nor any leaks.

The Acting President—Has anyone had any experience with the life of steel pipe?

Mr. Jones—The life of a steel pipe is a good deal like estimating the life of an individual. The insurance companies have a nice way of doing it, but they fail once in a while. It depends almost entirely I might say on the coating and on the manner of handling the pipe. It perhaps is not generally understood that it is not the thickness of the pipe but the coating that is the more important, and the handling of it subsequent to the coating—while it is being laid. Two-inch, plain end tubing should be thoroughly scraped free from all rust, and then it should have a good coating of red lead and oil. We have found that the best protection. After it has been coated no tools should be used on the pipe. It should be handled carefully. It should be placed in a wagon on a felt or some other sort of cushion, so as not to scratch the coating, and the pipe should be handled without tools of any kind or anything that will in any way mar the pipe coating. The length of life of the pipe should be in decades and not in years. I see no reason why a 2-inch pipe should not last 30 years. We found that in using the best quality of red lead and the best quality of boiled linseed oil, having it thoroughly mixed, and permitting the paint to dry without the use of any dryer (any turpentine or japan, which would make it dry quickly and brush off) was the best possible coating. It prevents oxidation where it covers the steel, but the red lead itself is subject to changes, which have been very disagreeable to us, and I am almost ready to propose, in fact, I will say that I am ready to use one good coating of red lead on the pipe, and after this is thoroughly dry to cover it with a good metallic coating. I do not want to advertise the paint, but I mean such paint as we use on our gasholders. It is an iron oxide, made by some of the Eastern manufacturers, and sets with a gloss which is very durable. I put it on gasholders and they retain their brightness for 4 or 5 years, although I do not say it is desirable for the gasholder to go as long as that without recoating. I believe in using the red lead next to the steel pipe, and protecting the lead with another coating of metallic oxide, iron oxide, such as we use for gasholder tanks.

Mr. Lowe—We are meeting with a very peculiar condition in Honolulu now. The street mains there were coated with red lead, and it is commencing to cause trouble in some localities—not in all parts of the city—and we are looking for a better preservative, and under the circumstances are turning to the water company who have had very much more experience than we. They state the only thing they have been able to find that would stand in that soil is galvanized pipe.

Mr. Jones—I think if you will use one coating of red lead and the asphaltum on the lead that it will last. This method is strongly advocated by the firm of Low Bros., paint manufacturers, somewhere in Ohio, who publish a very interesting pamphlet—it is almost a treatise on painting—and they are manufacturing all kinds of paint. They strongly advocate the use of red lead covered with an iron oxide.

Mr. Berkley—Will Mr. Cline give some of his experiences in Los Angeles?

Mr. Cline—The Los Angeles Gas and Electric Company has been operating a high pressure system something like 3 years, and the existing systems I should say cover 30 miles of standard wrought iron pipe. It is 12 inches, and probably 20 miles of 2-inch pipe. Part of the system is used for a feed line to the low pressure system, and is tapped in, I think, at about 6 different points with district governors set for an outlet pressure of about 8 inches. We have about 5,000 consumers on the high pressure lines, and our house governors are set for a pressure of 3 inches. The pressure plant consists of 3 compressors, 2 of the capacity of about 175,000 cubic feet an hour each, and the other of a capacity of 75,000. They are run by electric motors. We have no compression tanks and have never had one moment's interruption. We have never had an accident of any kind, and it has been most satisfactory from the time of its inception.

Mr. Berkley—What type of governors do you use?

Mr. Cline—Equitable.

Mr. Lowe—I think Mr. Jones should enlarge upon his remarks about plain end pipe and the necessity for not handling the pipe with tools, etc. This is all right for a 2-inch pipe, but when you lay down a service pipe, I think he should add a cautionary word or two.

Mr. Jones—We are very careful in laying the service pipes not to injure the coating, and the men are instructed to repaint them. Every injury is recoated.

The Acting President—We laid an 8-inch pipe 4 or 5 years ago that was painted before being laid in the ground, and after it was laid a man went over it and painted it again.

Mr. Weber—The majority of the members seem to be interested in high-pressure gas. Mr. Jones has thoroughly gone over our condition at Petaluma. We have a pipe line between Santa Rosa and Petaluma which is nearly 17 miles in length. It is a 2-inch steel pipe, with smooth ends and connected with Hammond couplings. This pipe was tested immediately after the earthquake, including the compression tanks and condenser tank, and was tested up to the regulators, and was disconnected at the regulators, which are almost in the center of the town. It was found perfectly tight. The compressor was kept on over ½ a day and did not drop the least bit. I would state that for services to individual consumers we use a ½-inch pipe, which is painted with 2 coats of red lead, and any tool marks that may be made on the pipe are thoroughly painted over and tested before the pipe is covered, in which way the pipe is protected as far as anyone can protect it by paint. We run 2 pounds pressure on our mains to the town, and then we use the Equitable individual governor for individual consumers, in some cases having as high as 6 meters on 1 service, but the ½-inch pipe always gives ample capacity to supply every customer.

Mr. Lloyd—I understood Mr. Jones to say he did not use or recommend the screwed pipe for line pipe, and I notice he uses in all of his installations plain-end couplings instead of the line pipe couplings or screw-end.

Mr. Jones—It is now well known that all threads in ordinary wrought iron pipe couplings are straight threads. The threads on the end of an ordinary piece of wrought iron pipe are cut with a taper die. The threads on the inside of couplings that are supplied with the pipe are ordinary straight threads, so that as you screw the taper thread into the coupling the joint depends on 2 or 3 threads, wherefore in nearly every instance the pipe screwed together with ordinary couplings will leak. If it does not at first it will develop later. Our next step to remedy the trouble was to use line pipe sockets, which are of extra length and heavy, and supplied with taper threads to correspond with the threads on the end of the pipe as cut with the ordinary pipe dies. This we found required much care in making the joints. It required the use of holding-on tongs, and that the joint should be made up and left—*i. e.*, the joint should not be disturbed. There is great danger in screwing lengths of pipe together. Each joint should be made separately. For that reason we have abandoned the use of screw joints on any of our high pressure feeding or distributing mains, and only where it is absolutely necessary on pipes below 2 inches in diameter. The high pressure couplings, as they are made to-day, are comparatively cheap and they are easily applied—the rubber, even if it is not durable in the presence of gas, will last many years, if it is not disturbed. I have found, however, that it is impossible to take the rubber gaskets from the pipe and use them over again; the rubber adheres to the pipe, making a permanent joint. I believe that it will last many years.

Mr. Van E. Brittón.—I would like to ask Mr. Jones what method he employs in making compression tanks tight before they are put into service.

Mr. Jones.—The best way to make a compression tank tight is, first, to select some good, honest boilermaker and ask him if he will make a tank of certain dimensions and of certain thickness, to stand a certain pressure, and put it up to him, and if that man does'nt work out a way of making it tight he will lose money. As a last resort, if the tank should leak, fill it with a solution of sal ammoniac and rust the leaks. It has been found of advantage, after the tank has been riveted and tested, to coat the seams on the inside and the heads of the rivets with a mixture of shellac and black oxide of manganese. In order to use this preparation the black oxide must be very evenly ground, as fine as flour. Mix it with the shellac, use no oil, thin with alcohol, and mix only enough for present use. Do not try to use it over again. This will, in nearly every case, stop small leaks, but it is better to make it tight from a boilermaker's standpoint.

The Acting President.—We have had a very interesting discussion on this subject, and I think we have all benefited by it. We will now pass to the reading of the next paper, by Mr. Clements, of Oakland, on the

ART OF CANVASSING.

Mr. President and Fellow Members of the Pacific Coast Gas Association:

About the 1st of August our Secretary wrote me he would like to have me prepare a paper to be read at this gathering. At the same time he suggested that the title might be "The Art of Canvassing."

The first thought that occurred to me was, can we call soliciting, drumming, canvassing (all synonymous terms) an art? On further thought I am convinced that we may so dignify it. Art, in the general acceptance of the term, is defined as the disposition or modification of things by human skill, dexterity, or the power of performing certain actions, which may be mechanical, useful, liberal or polite. Of course, I am to deal with the subject from the view-point of one interested in the gas industry, or it may be the electrical branch of the light and power business, or both. To diverge a little, let us see if canvassing is a question which interests the average gas man or the electric light and power manager. The answer is emphatically, "Yes," even from the chief in command to the humblest employee, because it brings in new business, new life, new money, and assures a continuation of business and employment. This I shall endeavor to show.

This is a commercial age, an age of new and useful invention, an age above all things else of earnest, active and even aggressive competition and rivalry.

The time was when, if the people wanted gas, they had to hunt up the gas company to get it; and in doing so they were likely to find the manager right on the ground where the gas was being made. Often he was found in the act of drawing or charging the retorts, or if he had an office it was located in the purifying room or in one corner of the coal bunkers. Very few gas companies had anything like the offices they now maintain. It needed the electric shock of conflict to develop the world. This shock finally struck the gas business. All this may sound strange to some of the younger men who read this paper, as they have only known the two branches of business working in unison, but, strange as it may seem, it is none the less true.

There are still some managers who believe that if the people want what they have to sell, they will come for it, and that they would be wasting time and money to go after the people. The time has long since passed for the gas company, its managers or its employees, to sit down and wait for business to come to them without some effort on their part to secure it. If anyone thinks different, all I have to say is I am really sorry for him, for I know that he will find his business declining, while the electric man, the gasoline man, and even "Coal Oil Johnny" are prospering. And why? Because they rustle, they canvass. As this is applicable to the man in the light and power business; in the same manner it applies to all branches of trade.

The manufacturers of Europe have their agents in the United States. On the other hand, the American manufacturer has his agents in Europe, and not only in Europe but all over the civilized world; and here we may ask, what for? Why, to sell the products of his labor and skill and to gain profit on his capital investments. Now, of course, the light and power companies do not have to go out of the immediate vicinity of their plants to look for new business, for the situation is much like missionary work; lots of it can be done at home with very good and lasting effect. You, my fellow members of the Pacific Coast Gas Association, all desire to increase your business, and no doubt are making every effort to do so. Among these efforts you are no doubt doing canvassing, some of you in a quiet way, among friends and neighbors, some by making displays of appliances, by having now and then lectures and demonstrations. Some of you have a canvasser in the field, or it may be an organized corps of canvassers. As the preacher would say, "This brings us to our text," and it brings me to the title of this paper, "The Art of Canvassing." To define it is rather a complex matter, and can only be given by me from the standpoint of observation and experience.

The prerequisites of a canvasser must be a pleasant and agreeable disposition; he must have a surplus fund of patience, to fortify him against the rebuffs he will at times meet with. He must have the courage of a true soldier in order to combat the oft-disrespectful greetings he will encounter, and, like a true soldier, he must not shoot (at the first alarm) the first man or woman who gives offense; he must remember above all things else that he is on duty to be polite, and thus to watch and safeguard the interest of the company whose representative he is. He is not at the door or in the store or office of a prospective consumer to make an enemy; on the contrary, he is there to make a business friend. Politeness is a fine art, so it is said; it spreads sunshine in places that without it would be dark, damp and dreary. We often read of sunny France. It is not so called because the sun shines brighter there than other parts of the world, but because the people are invariably polite. A friend of mine who spent two seasons in Paris said the politeness of the French people so impressed him that he felt if it had been necessary he could have borrowed money from any of them. I do not wish to be understood that my own ideas of politeness, as they apply to a canvasser for a light and power company, should be so far-reaching, because I am very closely connected with some of them that are not bankers. Still, I would insist on their being polite, even though some prospective consumer might fall into the error of my friend that visited Paris.

So I should say politeness is a factor. The canvasser must feel he has something to offer that every intelligent man and woman really needs and wants. For none can dispense with the use of light and heat. What he has to offer is the most modern method of producing these, and while he may now and then find a person who is a little doubtful, a little critical, still he knows that what he has to offer has long since passed the experimental stage and has become an actual, simple, everyday necessity. This gives him confidence, and confidence is his strongest factor.

With confidence that he is right a canvasser can push the electric button at the door bell; with confidence he can meet the lady of the house; with confidence, he can meet the busy manager of a large manufacturing concern; with confidence, he can meet the boss Chinaman of an overall factory; in fact, with confidence, that what he has to offer is up-to-date and offered at a price that is within the reach of all, he feels himself on a sound basis. He has confidence in his business, confidence in those whom he represents, and good, modest, earnest, honest confidence in himself.

Confidence is another factor. A proper knowledge of his work is very essential. If he is selling gas stoves, ranges, water heaters, gas grates or radiators, he should be familiar with their construction, and if possible familiar with the consumption, or rather, I should say, the

average consumption per hour. This, I may say, however, is the most difficult question there is to answer, because no two persons do the same thing in exactly the same manner. Therefore, no two persons use gas alike; therefore, averages only can be given. Again, a proper knowledge of this work requires the canvasser to be somewhat, if not wholly, familiar with the use of the articles enumerated. Thus, in order that he may give intelligent and simple explanation or demonstration, his knowledge should also extend to a fair understanding of the appliances with which he is to come into competition, in order that he may show the defects of the one and the good points of the other.

I can see no need of explaining to anyone here the advantages to be gained by the intelligent use of gas or electrical appliances; you are all familiar with them. If the canvasser is working in the power line, and the question is the choice of a gas engine, he should be familiar with the use of gas as applied to motive power. The amount of gas required per horse power hour, the comparative cost of installation of a gas engine versus steam installation. He should be able to take these things in proper order, so that he can answer questions (that will be shot at him) with exactness and decision. If he is talking with a prospective user of electric power he must be able to show him its special points and its ideal character. It will be well for him to have some data regarding existing concerns that are using such power. If possible, to cite the inquirer to some one who is using it in the same (or in a similar) line with what he has in view. The same rules as to cost of installation, cost of maintenance and expense of running will apply here as with what I have said about the gas engine, "Knowledge is a factor."

Knowledge is power, and power moves the world. Now, I do not mean by this the canvasser should have technical knowledge, although it would not be amiss; but what he really should know is the everyday practical knowledge as it relates to the business he has in hand. Usually the prospective consumer is a practical man, a mechanic, a good business manager, who knows what he wants from a practical standpoint, so that if you talk to him in high-sounding words and in technical terms he is more apt to be confused than instructed or enlightened. What he wants is fact and cost, and he wants them by comparison. With other things in the same line, so I should say make all explanations in the simplest and plainest terms possible. B. T. U., K. W., etc., can be reserved for the laboratory, the engineers, or the inner sanctum of the manager's office. To diverge once more:

The liberal distribution of literature—in other words, advertising matter—is a great adjunct to the canvasser. It introduces the subject and prepares the mind of the prospective consumer. So when a real pleasant, earnest and agreeable canvasser appears upon the scene, he is more apt to be given a studious and respectful hearing. A great deal might be said here about advertising, but as so much is being said and written upon the subject, I shall pass it by, simply saying, like Rudyard Kipling, "But that is another story."

Perseverance is an essential, and, therefore, an important factor in our art of canvassing. Yet I would not recommend it to the point of insistence, which is often taken by many persons for the same article. There is a marked distinction between the two. A canvasser may persevere in securing a consumer or a prospective purchaser. When the consumer or purchaser hesitates or is in doubt, or tells him to call again, or says he will consider the matter; under these circumstances the door (so to speak) is left open. But do not insist. Insistence is apt to make a dissatisfied customer, and such no light company wants; then insistence makes a man appear in the light of a bore, and when a man is really a bore the fact is generally discovered with electric promptitude.

The canvasser should study to possess himself with what the French call *tenue*, the definition of which (in the English) is equivalent to restraint, order, measure, style, conscientiousness, intention in demeanor. Being so possessed he is bound to be discreet, and to succeed he must be discreet.

If a canvasser does no more than make a favorable consideration he has done good work; it leaves him, to repeat myself, the open door, the opportunity to call again. But if the party interviewed flatly and decidedly says he does not wish any further consideration, drop him and let him send for you when he needs you, then meet him cheerfully; do not refer to his former state of mind; again persevere, but do not insist.

Insistence may do for the book agent; leave that to him. Sometimes, not often, it may do for the drummer or traveling salesman, yet he may by this means sell a merchant some line of goods with which he is not familiar by really insisting upon the merchant taking them on trial, to be returned, if not found salable. But with our line of business this will not do; these men, the book agents, or the drummer, may never meet their customer again. Not so with our business. The person cannot return the gas or current consumed, and besides, from this time forward we are to see our patron at regular intervals, through the medium of the statement taken, the collector, or he or she may make regular monthly visits to our offices, and thus we become acquainted with them, and in small towns and cities often intimate. We are receiving their money and they are parting with it. To become thoroughly acquainted with a man in a business sense one must either receive from or pay to him money.

A young married woman was once asked by a girl friend how and when she first got acquainted with her husband. The reply was, after she had been married, just two months, which was the first time she had asked him for money.

Now, when you ask people for money you generally have to show some good and sufficient reason for doing so. All of this brings me to another feature of canvassing, and that is the necessity of full explanation as to the rates the company charges for the commodity furnished. Be explicit in this respect, if it is the price of gas per 1,000 cubic feet, or electricity per 1,000 watts, the cost of running a service, the price of a range set up, or anything else. Make it plain; be sure that the new patron understands all these. If you do this you will save lots of trouble for the collector, or for the office, as the case may be. Do not be too hasty or over zealous; take plenty of time, but do not waste it, neither by procrastination nor undue haste. Here is where you are to exercise patience. Remember the old saying, "The longest way around is often the shortest way home." Time and patience may sometimes seem sacrificed, yet oftener than otherwise it will pay to make the sacrifice, if by so doing you can secure new and profitable business friends, and especially if you can retain the older ones. But you may ask, "What has this to do with the art of canvassing? My answer is, everything; for canvassing does not consist in the mere getting of new consumers. I have found it necessary to re-canvass with old friends. In such cases it is necessary to bring all your arts to bear upon them. If a man claims that he has been systematically robbed, that the methods of the company are unbusinesslike and unjust, and you can convince him of the error of his opinion, you have saved him as a consumer, which often requires greater tact or skill than it did in the first instance. Here is the opportunity of the canvasser. Here, if he is possessed of it, he can display what Edison calls his greatest faculty, that of seeing what should be done and knowing how to do it.

One of the greatest obstacles that the canvasser has to meet with is the dissatisfied consumer (if the person happens to live in the vicinity of his work). As a small grain of arsenic will poison a well of water, so it often happens that a complaining man or woman will spoil what appears a good chance to do good business. Now, I should say, if this person is near by hunt him up, and if possible find out what is the cause of his trouble.

I recall a case of this kind in my own experience. I had been canvassing for two days in a certain section where a few persons had made application for an extension of street mains. As it was necessary to make a showing of more profitable business than seemed to be in sight, I was sent out to see what could be done. I got along swimmingly the first day by calling on the residents and having a heart-to-heart talk with them, telling them that on the following day I would call for their signatures for service orders, etc. Everything looked rosy, and I was, as the New York politician says, "cock-sure" of getting about every house in the 2-block-run. So I returned to a late dinner and an early pillow. The next day, when I returned to the scene of my expected coup, I was rudely aroused from my slumbers by the intelligence that there had been a change of heart—that there were some things which would have to be explained; that a Mrs. Blank, who lived in the third block where an extension was being made, had had a meter set and a gas range put in; that she had gone to work with beautiful visions of light work and real economy, but that after a few days she found that she had been using gas at the rate of 25 cents per day, and this lady was advising her neighbors to look well to what they were doing before they were caught in the same kind of a trap. Here was a stunner for you. I, of course, knew there was a mistake, or a big leak, so I dropped the canvassing business for the time and hunted up the cause of the report. When I called upon the lady she said she was glad to have me call, as she was sure there was something radically wrong. I agreed with her. The meter had been set and in use only a short time. The man that placed it had given her a statement, so I had this to start from. I called the lady to read the meter with me, which she claimed she could do. On reading the meter I found that she had been using about 50 feet per day, at a daily cost of 5 cents.

You see, this lady did not quite understand how to read the meter. I then told her what I was doing in the vicinity, and that I had ceased operations on account of the 25-cent per day statement. She promised that she would set that right, that she would explain her error to her friends and neighbors, and she did, after which I succeeded in getting the signatures of all but 3 persons in the 2-block run. And when another man in the employ of the company that makes a specialty of selling gas ranges went into the district he sold more than the usual percentage of ranges, and at the same time got service orders from the 3 houses that I did not get. I relate this circumstance to show the necessity of following up in an agreeable manner a disagreeable report. I am fully of the opinion that this particular district will prove alike profitable to the gas company and the consumers.

For me to undertake to give any set rules for this work would be useless. Every canvasser and every prospective consumer has his own peculiar character. Each one is a law unto himself. As a canvasser comes in contact with the masses his very existence broadens, his ideas multiply, his vocabulary increases, his interest in his work, his interest in his employer's business and his interest in the welfare of his patron or consumer become common and identical.

In his relations as between the corporation and the consumer he must ever remember that the relationship is like unto the law of hydrostatics, whereby 2 bodies of water of different levels when brought into free communication finally find a common level. They become, so to speak, united, and, therefore, mutual in interests.

To sum up, I can at best but give impressions. Therefore, I would say the things that impress me as being essential to success in this line, and they are essential in many other lines, are politeness, patience, confidence, truthfulness, courage, honesty of purpose, adaptability of his surroundings, and to the people he meets with, the ability to show things clearly and make them understood. In this a vast amount of patience must be practiced. With these qualities developed the canvasser becomes possessed of confidence, which is his sure foundation and support.

I thank you for your kind attention. If you, my fellow members, can find anything in what I have here written that will prove of any value to you, I shall be fully repaid for the little time expended in the preparation. The business of the world moves so rapidly in these days that it is with doubt that one can claim anything to be new, and, therefore, it may be that what I have here said is very old to you; nevertheless, "A good old song, if sweetly sung, may sound as good as new."

Discussion.

The Acting President—You have listened to a very artistic paper at the hands of our past-President, Mr. Clement. I am sure it is a subject of interest to all of you, and I would be very glad to hear a full and free discussion on the subject. I know Mr. Clement would be glad to answer any further inquiries. I think I saw Mr. Berkley's notebook working again.

Mr. Berkley—I think the cardinal points of the paper are well taken. I do not think I could say anything that would add particular weight to it, because he has covered the subject entirely. I do not believe we can lay too much stress upon the art of canvassing. I rather like that term. There are only a few people who can do it successfully, and I think one of the places where we fall short is that we do not have enough artful solicitors and canvassers.

Mr. Lowe—I believe the matter has been very carefully covered. I believe someone said that the art of anything is having your heart in it, and that without heart there can be no art. The success of a canvasser or solicitor depends very largely on his heart being absolutely in his work, loyalty to the gas interests, aside from personal questions and personal interests. I believe that the success of a company depends more largely perhaps on the canvasser and solicitor than on any other man, as he comes more directly in contact with the public.

Mr. Clements—Within the last 2 weeks I was in Berkley making a survey for an extension, and one lady in the neighborhood made application for a service. She had just moved into a new house, but expected to get in there 3 months before. I said to her: "I came here to see you about gas service." She said; "You did? Do you know that there is the biggest lot of liars in Oakland and Berkley than any place I have ever seen. How do I know that you are representing the gas company? You see there is a big lot of liars here, and I admit that I am something of a liar myself!"

The Acting President—Is there any further discussion on this paper?

Mr. Kinney—I think one of the best ways to become a successful solicitor is to make business friends who will assist and help you in a business way. No matter whether it takes a day or a month or a year, make friends that are of value to you. It is worth working for, and I believe the most successful solicitors in the business world are those who make the most friends.

The Acting President—Mr. Britton, of Santa Cruz, has been devoting a great deal of time of late to extending his system and getting new business. I would like to hear from him.

Mr. Van E. Britton—We have been somewhat handicapped during the last few months in Santa Cruz in having more business come to us than we could care for, owing to the condition of our mains, and another drawback has been our inability to make a proper display room.

The Acting President—We have listened to a very interesting paper, and I know that we have all benefited by it. The meeting will now adjourn until 2 o'clock P.M.

(To be Continued.)

[Communicated by "R."]

Mechanical Draughting in the Gas Plant.

The term draughting in the gas plant means something different from the same term as applied to ordinary mechanical sketching in the usual line of business. There is a constructive process in operation in the gas plant through which it is essential that certain details of a pipe or steam boiler design be observed. The gas plant draughtsman requires skill and an artistic touch in order to produce the wide range of pipe and pipe connection designs required; therefore, the use of different instruments forms an essential factor. First of all he needs the right sort of draughting paper. It is a good plan to have an outfit of this paper in a roll, as in Fig. 1. This roll can be suspended just above the sketching board as shown. The paper can be pulled down from the roll as used. Good bond paper, about 20 inches wide, is usually employed for general work. The surface of this paper is hard. The price is low. Photographic copies can be made on it. Tracing can be executed. A stand of special build should be used, a drawing of one of which is exhibited in Fig. 2. The sketching top or board is made about 6 inches wider than the paper; soft pine is the best, so that the thumbtacks can be pressed into the fiber. An excellent plan is to have the board arranged to tilt, as shown. This can be done by using the uprights of hardwood, tenoned into the base piece.

There are 2 joints effected by the use of the hardwood plugs or pins. Therefore it is possible to tilt the board in any direction to suit the needs of the artist.

The draughtsman will find it exceedingly convenient to use a set of draughting circles and forms, one of which is presented in Fig. 2. You describe your circle on the plain paper in the usual way, and then you proceed to execute the elements of a circle, applying the same to the work in hand. In this cut the darkened portion represents the work in process of designing at an angle. You can make the area complete or only the half-circle, as shown. Then check this off to get the tangent from B, to the cross line above, the cotangent from C to F, the cosine from D to E, the sine from E to G and the diameter from B through A to the other side. You can run off your angles on these lines to accommodate the requirements of the pipe system. In this case the angle runs through the line of radius A to C and beyond to the point at F. Perhaps you want to get a curve executed on one of the projections of the pipe. Then you can proceed, as demonstrated in Fig. 4. This is the complete circle with its elements prescribed. The radius of this circle is from A to C, and the line of the pipe extends along this as shown. The sector is from A to D. The diameter may be taken from B across. To get the proper curve on the pipe you follow the diameter of the circle, as illustrated. You can go all the way around, or stop at any designated point on the circle. A curved pattern of the character shown in Fig. 5 can be used in some work.

You will need a series of curved patterns in all lines of pipe work. These curved patterns are used time and time again, when once made. In fact, some of the artisans preserve a selection of the patterns in apartments especially constructed for the purpose. These curved patterns are a source of trouble in many cases, but when correctly designed and applied are very convenient. They save considerable diagram work. A single curved pattern is shown in the cut. There are true curves executed with the compass, and these curves may be depended upon as reliable. They are called the simple parabolis curves, generated from the diagram exhibited. The diagram shown can be used for scale work, if desired. The prescribed lines of the curve can be followed with the pipe forms and the designated curvatures readily executed.

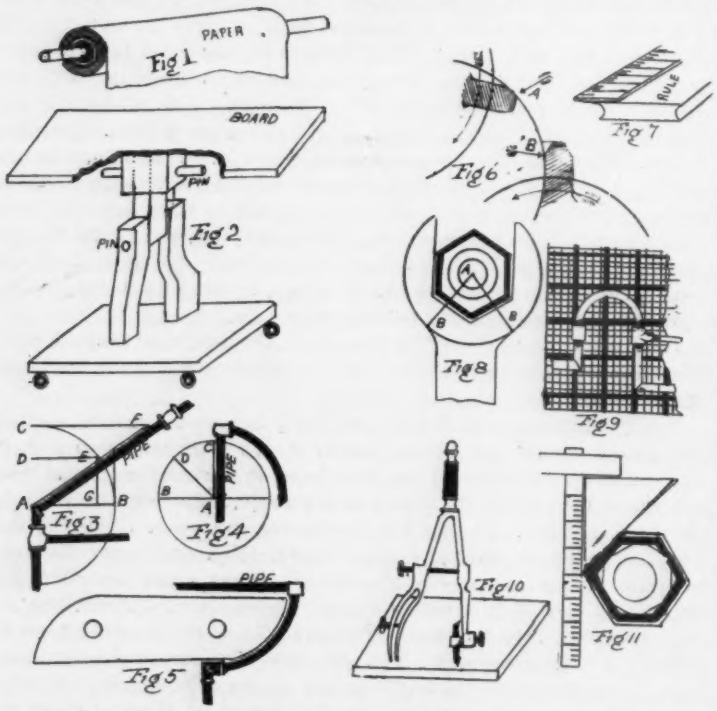
Sometimes you have to produce gears in connection with the usual run of work, and Fig. 6 is intended for a plan to help out. Here we

show the diagram as made for involute teeth or cogs. If pinion wheel is needed, the project involves the establishing of defined lines from a given point of revolution, so that in making the turn the two edges of the cogs will pass readily, as at the defined curve *A* and *B*. If there is any grating of the cogs there is danger of the wearing off of same, and perhaps riding and stripping. If you make fast at a point on the rim of the driver gear, and roll the templets together, you can readily define the proper line for the meshing of the cogs. In order to execute the lines which are straight in this work it is advisable to have a ruler of the character shown in Fig. 7 at hand.

This consists of the common description of finished hardwood ruler with the templet of metal riveted on. This metal strip serves as a guide for the ruling pen.

Suppose we want to execute a wrench for use in operating in pipes. Fig. 8 is a drawing of the diagram which can be made. You should make a circle complete, large enough to just touch the sides of the jaws; from the center of this circle draw your lines *A* to *B*, *B*. Then cut the circle direct across the jaws, and you can easily define the extent of the same. The radius for the back is taken from the center, *A*. You can make the size and thickness of the tool as desired.

Some workmen use regularly ruled draughting paper for this work, a sample of which is exhibited in Fig. 9. The paper is properly ruled off in blocks, and these block lines are followed when making up the adjustment of the pipe. The specified lines can be followed. This aids materially in the making of the plans for specially described installations of piping. Fig. 10 is a drawing of a handy type of drawing instruments which you should possess. In fact, it will pay to go to the dealer in artists' material and put in quite a little complement of tools for executing diagrams and drawings for pipes and gears. You may desire to run off some outlines of nuts to use on pipe work. Fig. 11 explains how the common triangle with the "T" square may be employed in producing lines for the hexagon shaped nut.



Adopting the Micrometer Caliper.

Iron Age notes that builders of machinery which is employed in the manufacture of precise work have not been able to overcome the reluctance of some manufacturers to adopt the micrometer caliper. The prejudice against the instrument appears to be based chiefly on an incredulity that the human hand is sensitive enough to handle the instrument in measuring halves or quarters of thousandths of an inch. The result is that certain machines, notably grinding machines, lose much of their real usefulness in some works. To-day a quarter of a thousandth is an accepted measure in the best machine shop practice. It is quite commonly used as a limit of variance from a standard size. Parts are produced by the thousand with no greater variation than this. Yet there are those who will not accept the established practice of using the only instrument which can measure work to this degree of precision. The ordinary spring caliper will not do it, excepting in the hands of an unusually skilled workman. But it is perfectly possible for an inexperienced workman to use the micrometer caliper in ordinary everyday work and get the necessary results, exacting though they may seem to be.

The great trouble is that men do not realize how very accurately they had been working in the days before precision was required by new conditions. The entrance of an arbor into a bored hole means a fraction of a thousandth of an inch per inch of arbor, and this often afforded a measure of work before the micrometer came into its present general use. The standard gauge, to which men worked for years, is really nothing more or less than a micrometer of a set size. Most builders of machine tools have accepted the micrometer in everyday work, but still there are a few who have not, and in other brancees of machinery manufacture the number is probably greater. It should be borne in mind that the machine practice of to-day is very different from that of a decade ago. Greater demands are made upon machinery, and to insure the durability and accuracy of mechanisms there must be the best possible workmanship. The micrometer assists materially in securing these conditions, and, what is a really important factor in the question, a rather inferior workman can do work with its aid that would otherwise require the services of a highly trained mechanic. Doubtless the new practice will be universally accepted before a great while, as necessity compels it, in machine shops. The sooner it is adopted the better for the shop owner.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. Edward B. Meginnis has resigned the position of General Manager to the Dallas (Tex.) Gas Company. His successor is Mr. J. A. Myler, Jr., who has been in charge of the engineering force of the Company for some time.

The Morgan Construction Company, of Worcester, Mass., has been awarded the contract for the building of 140 producers at the Gary plant of the Indiana Steel Company.

Articles have been filed under which the organization of the Southern Dutchess Gas and Electric Company has been perfected. The articles which were filed in Biddeford, Me., some days ago, declare that the purpose of the Company is to deal in the stocks, bonds and other securities issued by the Southern Dutchess Gas and Electric Company. It is capitalized in $100,000, and the officers are: President, George B. Goodwin, Biddeford, Me.; Treasurer, J. A. Snow, Scarboro, Me.

Mr. H. H. Stephens, of the El Reno (Okla.) Gas and Electric Company, writes us thus under date of the 14th inst.: "We note in the published list of names of membership of the American Gas Institute the following: 'R. N. Strohn, Treasurer and Purchasing Agent, the El Reno Gas and Electric Company, El Reno, Okla.' In your issue of October 29th the name of R. N. Strohn, El Reno, Okla., appeared on the attendance roster. This party is not now and never has been connected with the El Reno Gas and Electric Company in any way. Mr. C. A. Wilson, of Holly, Mich., is Treasurer, and Mr. H. H. Stephens, of El Reno, is Manager and Purchasing Agent. Further, we are unable to find the name in our city directory or anyone here who knows the gentleman named."

Mr. W. E. Davis has resigned the position of Superintendent to the Peoples Gas and Electric Light Company, of Xenia, O., to accept the Superintendency of the Owensboro (Ky.) Gas Light Company.

The Gas Machinery Company, of Cleveland, O., has been awarded the contract for a 5-foot water gas apparatus of the double-superheater type, to be put up in works of the Peoples Gas and Electric Company, Mason City, Ia.

We are in receipt, through the courtesy of Mr. H. S. Carpenter, of a copy of the Bristol Company's new gauge catalogue, No. 44, which really is a substitute for the old catalogue which bore the number 13. The grouping of the gauges is made according to size and capacity, which system enables one to find easily the type of instrument best suited for the work in hand. The listing also includes the Company's new portable pressure gauge, which is designed for use in situations where a permanent installation is not necessary. The Company will be pleased to send these catalogues out to those who make application therefor.

Mr. L. C. Graham, of the Winona (Minn.) Gas Light and Coke Company, writing under date of the 14th inst., says: To the Editor American Gas Light Journal: Your news item in recent issue regarding the sale of coke in Grand Rapids was quite interesting, although we probably do a little better here in Winona. For the past 6 weeks we have had to buy coke to fill our orders. Last year the sheds and yard were so full of coke that there was hardly room to wheel out or pile up any more. By educating the people in its use we have suc-

ceeded in disposing of the accumulated stock and much more than we have made. The summer price was $6 per ton, delivered. It is now bringing $7.25 per ton. Soft coal sells for $5 to $6, and anthracite sells for $9 to $9 50 per ton. In the near future we expect to get within 50 cents of the anthracite price. Why not? It has the same heat value per pound, and when one learns its use it can be made to go further.

THE fire which occurred some days ago in the generating plant of the Queens Borough Gas and Electric Company, Rockaway Beach, L. I., was not of sufficient moment to keep gas off the district. Some good fire extinguishing capacity was shown by the Company's force.

THE two new storage holders for the Boston Consolidated Gas Company—the first at the North End, with a capacity of 2,500,000 cubic feet, the other in the Roxbury division, with a capacity of 4,000,000 cubic feet—will be put into commission by December 20th.

MR. CHARLES K. HASKELL has resigned his position as Treasurer of the Gas and Water divisions of the public departments of Buffalo, N.Y.

AT the last meeting of the shareholders in the Brooklyn Union (N.Y.) Company no change was made in the executive management. No dividend for the quarter was declared.

MR. A. R. FISKE, writing from Richmond, Va., under date of the 19th inst., says that the charter issued to the McLemore-Whitfield combination, of Philadelphia, under which they and their associates are empowered to construct and operate a gas and electric plant in Suffolk, Va., specifies that the capital stock shall not exceed $250,000. The President, Mr. James L. McLemore, declares that construction work will be undertaken at once, but it looks to us that next spring will be nearer the mark.

MR. JOHN J. GANNON has resigned from the service of the Savannah (Ga.) Gas Company, to accept the works' management of the Dover (N. J.) Port Oram and Rockaway Gas Company, vice Mr. Geo. L. Benbow.

MR. H. H. CROWELL, of Syracuse, N. Y., has been appointed expert to the New York State Commission of Gas and Electricity.

THE Brookline (Mass.) Gas Company has brought suit against Thomas H. Connolly, contractor, to recover damages to plaintiff's main pipes, caused by the negligence of the latter in the carrying out of certain blasting operations.

THE new holder for the Boone (Ia.) Gas Company was satisfactorily put into commission the morning of the 15th inst. It is rated to store 152,000 cubic feet, and work thereon was commenced April 15th; that is, the work on the concrete and steel tank was then started.

MESSRS. HELME & MCILHENNY, of Philadelphia, will accept our thanks for an example of about as convenient a paper weight as ever did duty on a desk. It is in the shape of the index of a 5-light meter, and is a very handy device to use when explaining to a consumer how a meter can be read.

THE bids received by the public authorities of Highspire, Pa., on account of the public lighting of that place, were: Dauphin County Gas Company, improved Welsbach street lighting type of light, $30 per lamp per annum; Steelton Light, Heat and Power Company, are electric lamps, $53 each per year; incandescent electric lamps, $23.

MR. E. B. MEGINNISS has resigned the post of General Manager of the Dallas (Tex) Gas Company, to engage in business in New York. His successor at Dallas is Mr. J. A. Myler, Jr.

WHAT is the good, use or sense of a State Commission of Gas and Electricity in and for New York? The question is prompted through the recent action of Mayor Gaus, of Albany, who has instructed the Corporation Counsel of that city to prepare bills to be introduced in the Legislature, when that heterogeneous body shall have convened, ordering that the gas rate shall be reduced to $1 per 1,000 cubic feet, the rate for electric current to be not in excess of 10 cents per kilowatt hour.

THE City Gas and Oil Company's manipulators are asking for the right to construct and operate an artificial gas plant in Marion, Ind., but they are asking for a minimum rate of $1.40 per 1,000 cubic feet. Mr. A. S. Stricler is attorney for the Company.

THE City Council of Minneapolis, Minn., will open bids for the public lighting of that place for 1 year, in so far as gas and gasoline lamps are concerned. Figures are asked on 5,000 incandescent gas and 400 incandescent gasoline lamps.

MR. FRANK H. HESS has resigned the Superintendency of the Traverse City (Mich.) Gas Company, to assume a similar position at Redlands, Cal.

THE Richmond (Va.) City Gas Works has a total of 9,625 meters in use, and it is estimated that the profit by the city in the operation of the works for the current year will amount to just under $75,000. This sum includes a fair charge for the gas furnished free on public account for street lighting and public buildings.

IT has been virtually determined to cut the maximum selling rate at Davenport, Ia., to $1.25 per 1,000 cubic feet.

MR. GEORGE D. CASE, a prominent manufacturer of Milledgeville. Ga., is our authority for the statement that that city is both ripe and ready for a gas works. The place is certainly growing, and the growth is of the healthiest sort.

"T. R. S.," writing from Atlanta, Ga., under date of the 20th inst., says: "In the case of Mr. R. Freeman *vs.* the Macon Gas Light and Water Company, the State Supreme Court of Georgia has just ruled that a private company which puts itself in the position of a public service corporation can be sued not only for damages by a private citizen, but that such citizen has the right to force it by mandamus to perform such duties as it owes the public. Freeman sued the company for $2,500, alleging that it cut off the water from his residence without notice, although 5 days' notice is required. It was also alleged that the company cut off the water without legal cause and that the members of the family were ill at the time. The suit was thrown out on a demurrer in the City Court of Macon. The Supreme Court finally holds that this was an error and that the plaintiff had ground for action against the company, the same being in the position of a public corporation."

AT the annual meeting of the Elizabethtown Gas Light Company, of Elizabeth, N. J., the directors elected were those who served last year. After the meeting was adjourned the Directors and many of the public men of the city were entertained at a luncheon, the host being Senator John Kean, President of the Company.

GREAT BARRINGTON, MASS., wants a gas supply, and it is not at all unlikely that the demand will be complied with by the Great Barrington Electric Light Company, the proprietors of which have in their franchise grant the right also to supply gas to the town.

THE authorites of Winnetka, Ills., are talking about establishing a gas plant, the same to be operated on municipal account.

THE Lancaster Mills, at Clinton, Mass., are agatn being supplied from the mains of the Clinton Gas Light Company. Several years ago the Company put in an electric lighting plant and the gas was shut off. The limit of that plant having been reached some time ago, it has now been determined, rather than to enlarge it, to come back to gas.

MR. S. C. MCCORKINDALE seems to be getting along pretty well in his new position as Manager of the lighting and street railway properties that are controlled by the Granger-Farwell syndicate.

MR. J. E. KING is doing good work in connection with his new position as Manager of the Lebanon (Pa.) Company's properties.

IT is said that the plants of the Coos Bay Gas and Electric Company will be constructed with all possible dispatch.

The Hydraulic Jack.

Mr. Albert H. Smith recently told in the Philadelphia *Public Ledger* this story of the life and services of the late Sir Richard Tangye:

The story of his career seems more like a romance of American enterprise than the ordinary history of British success. When a poor boy working upon his father's rugged Cornish farm he had, as he was wont to say, the good fortune to break his arm. The surgeon who set it told his father that the lad would perhaps never have the full use of it again, and as he was undersized and lacked the robust health and vigorous strength required for the rough work of the farm it would be wise to give him an education that would open the way to some clerical and sedentary occupation. The advice was taken and Richard Tangye received such education as could be imparted in a small school in the remotest corner of England. For a while he taught school, but with his first earnings removed to Birmingham to engage in the kind of business for which his mechanical genius and expertness seemed to qualify him. The hydraulic jack, the invention of George and Richard Tangye, laid the substantial basis of the family fortune. When the Great Eastern was built it was found impossible to launch the gigantic vessel. The skill of the best engineers of England was exhausted in the futile effort. By a fortunate accident the launching committee entered the obscure little shop of "Tangye Brothers, Engineers," who confidently expressed their ability to perform the task. It was the beginning of their great success, and to-day the Cornwall Works covers several acres of land in the city of Birmingham and has thousands of men on the pay roll. It is a saying at the works, "We launched the Great Eastern, and she launched us."

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

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No. 42 Pine Street, New York.
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Single copies, 10 cents.

MONDAY, NOVEMBER 26, 1906.

The Market for Gas Securities.

The market for city gas shares showed considerable improvement, although the advance was not as prominent as many thought would be the case. The again passing of the quarterly dividend by the Brooklyn Union Gas Company, which was certainly expected, excited a depressing effect. Dividend or not, however, Brooklyn Union is certainly a purchase.

Chicago gas moved up smartly during the week, the opening to-day (Friday) having been made at 93⅝ to 93¾. This stock should go to par before January 1st. The American Gas Company has declared a semi-annual dividend of $3 per share, payable to holders of record, the 23d inst.; on the first prox. Mr. Walter Godley, the Company's Treasurer, will forward checks.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

NOVEMBER 26.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	138	139
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	4,000,000	1,000	101	104
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	..	105
Mutual	3,500,000	100	190	225
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	98½	0
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p.ct.	1,000,000	..	98	104
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	,000	101	103
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	108	111
Con. 5's, due 1945, J. & J.	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
1st Mtg. 5's, due 1930, M. & N	1,500,000	1,000	104	108
The Brooklyn Union	15,000,000	1,000	105	120
1st Con. 5's, due 1948, M. & N	15,000,000		107	..
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Bay State	50,000,000	50	5/16	¾
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	500,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	105¼
Cincinnati Gas and Electric Co.	29,500,000	100	100	100¼
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,026,500	100	107½	108
Consumers, Toronto	2,300,000	50	200	204
Consolidated, Baltimore	11,000,000	100	..	90
Mortgage, 6's	3,500,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
" Bonds, 5's	10,500,000	..	107½	108½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	.	105
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Massachusetts Gas Companies of Boston	25,000,000	100	58¾	59
Preferred	25,000,000	100	85½	85¾
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	93⅝	93¾
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	100	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,600,000	20	293¾	295
First mortgage 6's	600,000	..	..	.
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del.	600,000	50	230	..

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DIVIDEND NOTICE.

OFFICE OF THE AMERICAN GAS COMPANY,
222 S. THIRD ST., Philadelphia, Pa., Nov. 21, 1906.

The Board of Directors of The American Gas Company has this day declared a semi-annual dividend of 3 per cent., or $3 per share, on the capital stock of the Company, payable on Dec. 1st, 1906, to stockholders of record on Nov. 23d, 1906, at 3 P.M. Transfer books close Nov. 23d and re-open Dec. 3d, 1906. Checks will be mailed.

1642-2 WALTER GODLEY, Treasurer.

Estimates furnished for the erection of complete gas works or the extension and modernizing of old works. All work warranted. Both water gas and coal gas.

EMPIRE GAS IMPROVEMENT & CONSTRUCTION COMPANY,
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As Manager of a Gas and Electric Light Plant,

By a man who has successfully operated a combined gas and electric light plant, who thoroughly understands the manufacture of coal and water gas, its distribution under high and low pressures, and who is an up-to-date manager.

Address, "S. C. A.,"
1641-4 Care this Journal,

Wanted, Position

As Manager or Superintendent of Plant,

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Address, "J. S.,"
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Position Wanted.

A Capable Manager and Superintendent,

Now employed, desires a position as manager or superintendent of gas, or combined gas and electric plants, in city of 15,000 to 25,000 population. Successful record. Southern or Middle States location preferred.

Address, "P. T. A.,"
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The advertiser desires to secure a position as assistant to the president or secretary of a gas company. Is proficient in short hand, has a good knowledge of grammar and is well up in composition. Age 26. Can furnish any necessary reference.

1641-2 Address, "H. N. C.," care this Journal.

POSITION WANTED.

Archibald S. B. Little, age 28, 13 years' experience as gas works contractor, builder of 53 benches of inclined retorts, manufacturer of miles of conveyors to own designs, wishes to start as engineer to responsible American company. Five years general manager and engineer to New Conveyor Company Best references. Address, till January, 28 Shrewsbury Road, Forest Gate, London, England.

1640-3

Position Wanted

By an All-Round Gas Superintendent.

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1641-2 Care this Journal.

Position Wanted

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1642-2 Address "M. T.," care this Journal.

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BUTTE GAS LIGHT AND FUEL CO.,
1641-3 BUTTE, MONT.

WANTED,

Working Foreman for Electric Department,

To look after outside construction from power plant to consumers in town of 50,000. Address, stating experience, salary wanted, also giving references,

"K. W. C.,"
1641-2 Care this Journal.

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With a capacity of 12,000 or 15,000 cubic feet per hour. State price, age and condition.

Address, "L. H. P,"
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ONE 25-HORSE POWER GAS ENGINE,

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The Gas Engineer's Laboratory Handbook,

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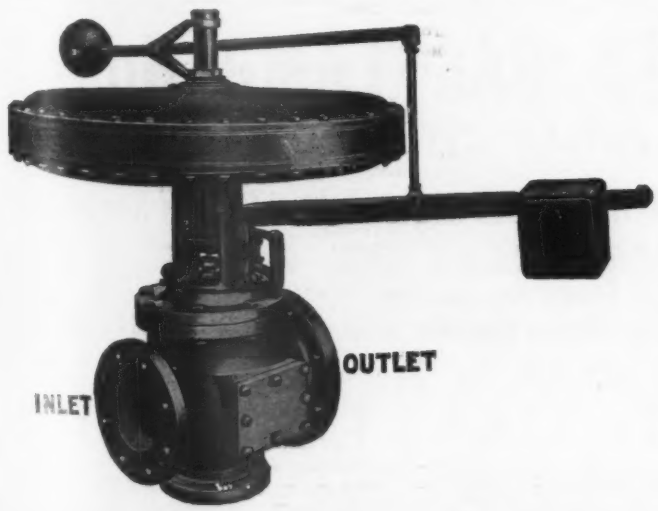

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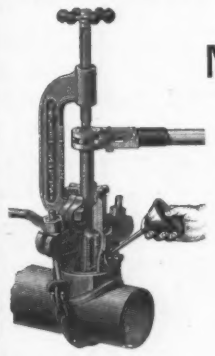

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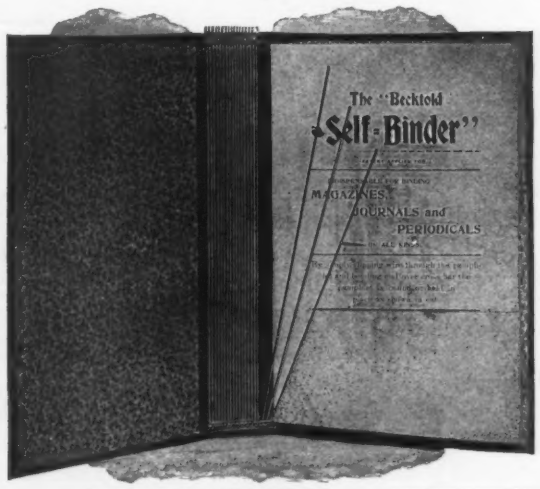

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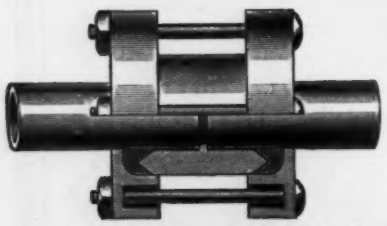
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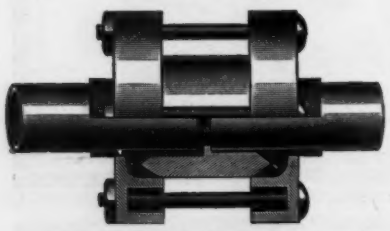
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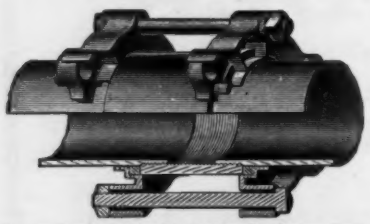
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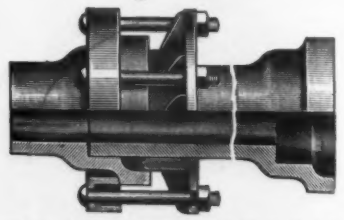
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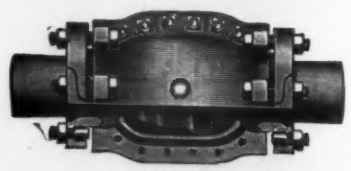
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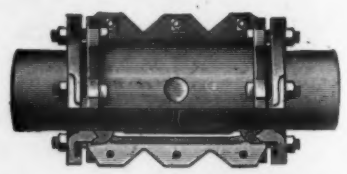
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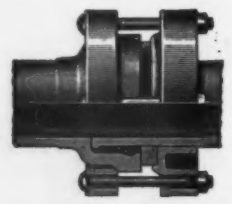
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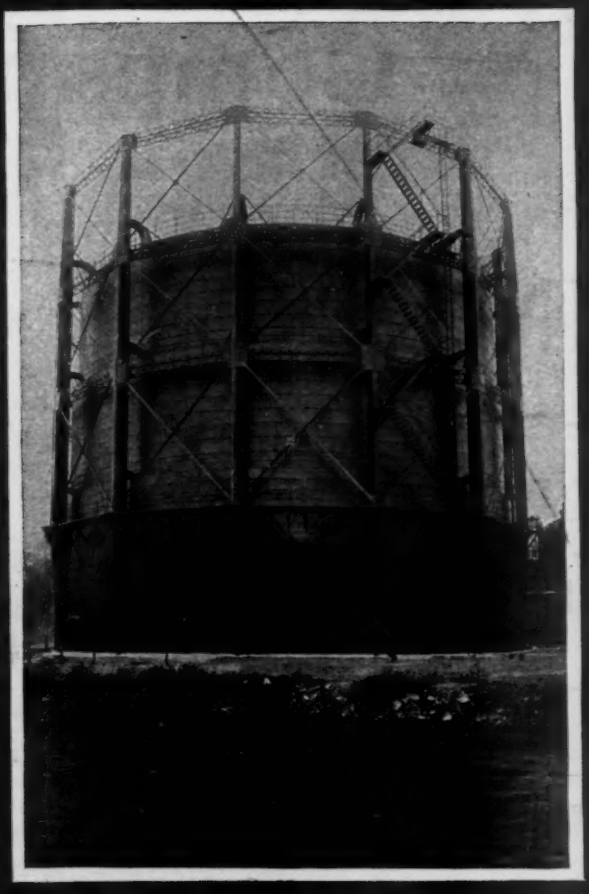

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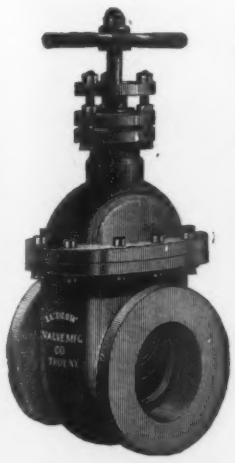

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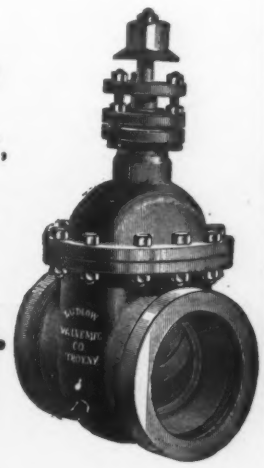

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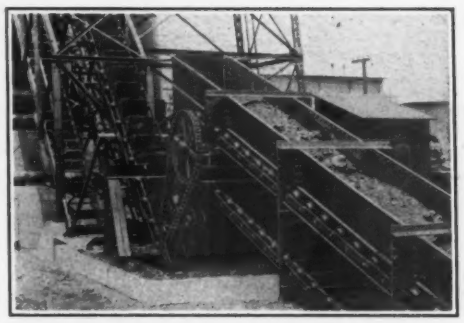

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Cox's High Pressure Fluid Discharge Computer.

This Computer solves the following formula, which is applicable to Gas, Air and other elastic fluids, flowing through long pipes with high initial pressures:

Discharge in cubic feet per hour at atmospheric pressure $= 33.3 \sqrt{\frac{d^5 \times (p_1^2 - p_2^2)}{L \times w}}$

Where

d = diameter of pipe in inches,
p_1 = absolute initial pressure in pounds per square inch,
p_2 = absolute terminal pressure in pounds per square inch,
L = length of pipe in miles,
w = specific gravity of the fluid when air = 1.

To Find the Discharge from a Pipe and the Required Size of Pipe.

(1.) Set the specific gravity of the fluid opposite the length of pipe;

(2.) Bring the DIFFERENCE of the initial and terminal gauge pressures opposite the SUM of the initial and terminal gauge pressures;

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(4.) Opposite any desired discharge will also be found the required diameter of pipe.

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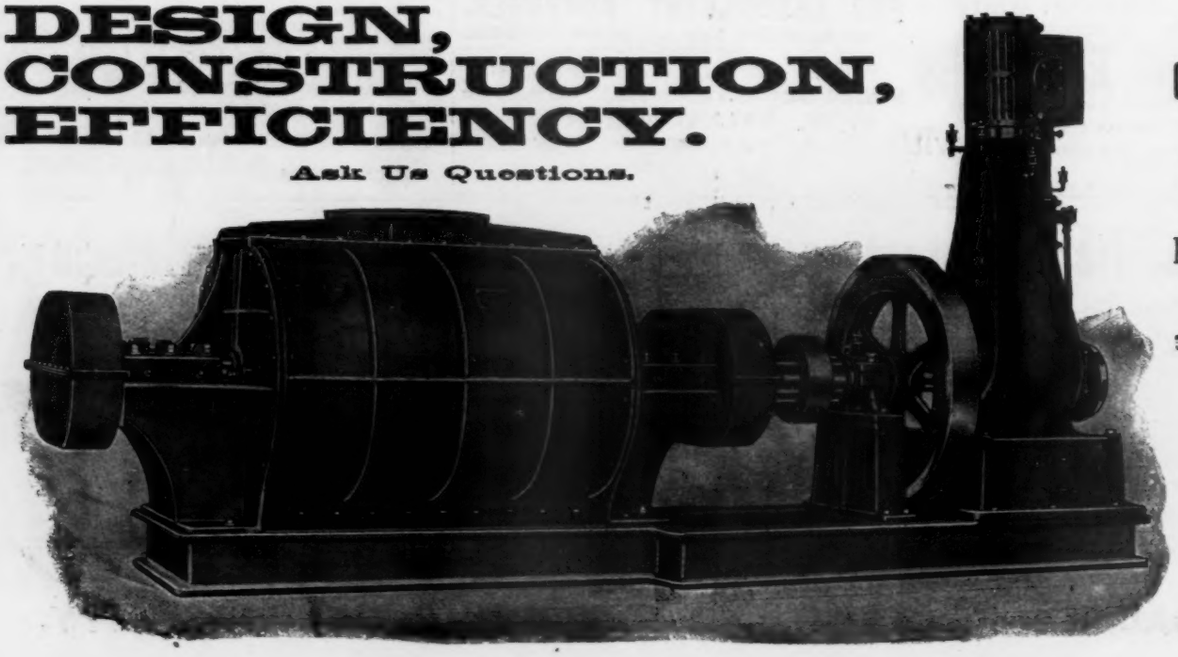

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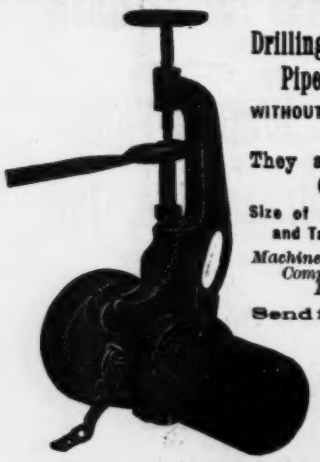

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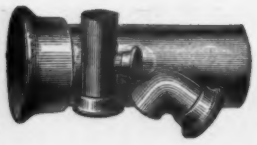

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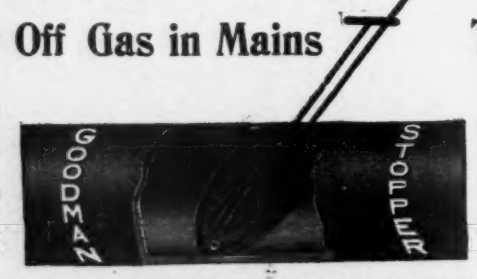

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For the Year 1905.

An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland. Being the 37th Year of Publication.

COMPILED AND ARRANGED BY **JOHN W. FIELD,**

Secretary and General Manager of The Gas Light and Coke Company, London.

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PUBLIC LIGHTING TABLE.

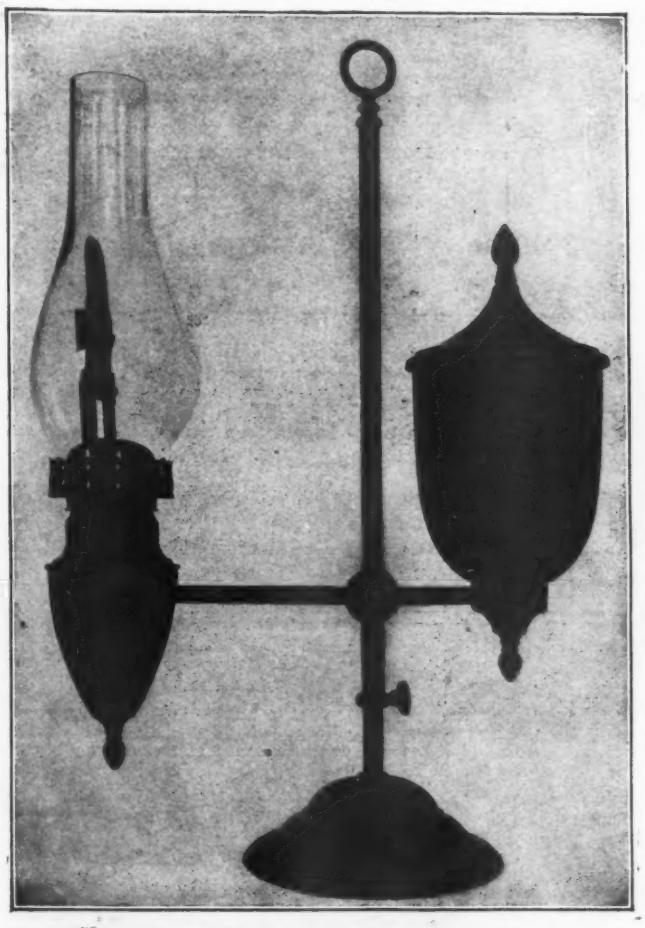
DECEMBER, 1906.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Sat.	1	No L.	No L.
Sun.	2	5.00 PM	7.10 PM
Mon.	3	5.00	8.00
Tue.	4	5.00	8.50
Wed.	5	5.00	9.40
Thu.	6	5.00	10.40
Fri.	7	5.00	11.40
Sat.	8	5.00 LQ	12.40 AM
Sun.	9	5.00	1.50
Mon.	10	5.00	3.00
Tue.	11	5.00	4.00
Wed.	12	5.00	6.10
Thu.	13	5.00	6.10
Fri.	14	5.00	6.10
Sat.	15	5.00 NM	6.10
Sun	16	5.10	6.20
Mon.	17	5.10	6.20
Tue.	18	5.10	6.20
Wed.	19	5.10	6.20
Thu.	20	9.20	6.20
Fri.	21	10.20	6.20
Sat.	22	11.20 FQ	6.20
Sun.	23	12.30 AM	6.20
Mon.	24	1.20	6.20
Tue.	25	2.20	6.20
Wed.	26	3.20	6.20
Thu.	27	4.10	6.20
Fri.	28	5.10	6.20
Sat.	29	No L.	No L.
Sun.	30	No L. FM	No L.
Mon.	31	No L.	No L.

TOTAL HOURS DURING 1906.

By Table No. 1.

	Hrs.Min.
January	223.40
February	190.40
March	192.10
April	167.00
May	152.20
June	142.10
July	150.20
August	157.40
September	170.00
October	185.10
November	201.40
December	214.00
Total, yr.	2146.50



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10-Candle Power.

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This lamp is a perfect substitute for the 10-candle Pentane Lamp hitherto used, and has the following advantages:

1st. It uses Standard Kerosene Oil (Pratt's Astral Oil or equivalent).

2d. It is remarkably steady. Will burn 24 hours continuously with less than 2 per cent. variation.

3d. It is much less dangerous than Pentane, which is a kind of gasoleffe.

4th. It is not easily affected by air currents in the photometer room.

5th. Since the lamp may burn continuously, the candle power of gas may be taken at any moment, if necessary. This insures steady illuminating power without waste of carburetting material.

6th. The first cost of the lamp brings it within the reach of even small gas works.

7th. Costs much less to maintain than a Pentane lamp or sperm candles doing the same service.

8th. Is not affected by the weather.

PUBLIC LIGHTING TABLE.

DECEMBER, 1906.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. All Night Lighting. Light	Extinguish.
		P. M.	A.M.
Sat.	1	4.20	6.10
Sun.	2	4.20	6.10
Mon.	3	4.20	6.15
Tue.	4	4.20	6.15
Wed.	5	4.20	6.15
Thu.	6	4.20	6.15
Fri.	7	4.20	6.15
Sat.	8	4.20	6.15
Sun.	9	4.20	6.15
Mon.	10	4.20	6.20
Tue.	11	4.20	6.20
Wed.	12	4.20	6.20
Thu.	13	4.20	6.20
Fri.	14	4.20	6.20
Sat.	15	4.20	6.20
Sun.	16	4.20	6.20
Mon.	17	4.20	6.20
Tue.	18	4.20	6.20
Wed.	19	4.20	6.20
Thu.	20	4.20	6.20
Fri.	21	4.20	6.20
Sat.	22	4.20	6.20
Sun.	23	4.20	6.20
Mon.	24	4.20	6.25
Tue.	25	4.20	6.25
Wed.	26	4.20	6.25
Thu.	27	4.20	6.25
Fri.	28	4.20	6.25
Sat.	29	4.20	6.25
Sun.	30	4.20	6.25
Mon.	31	4.20	6.2..

TOTAL HOURS DURING 1906.

By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	**3987.45**

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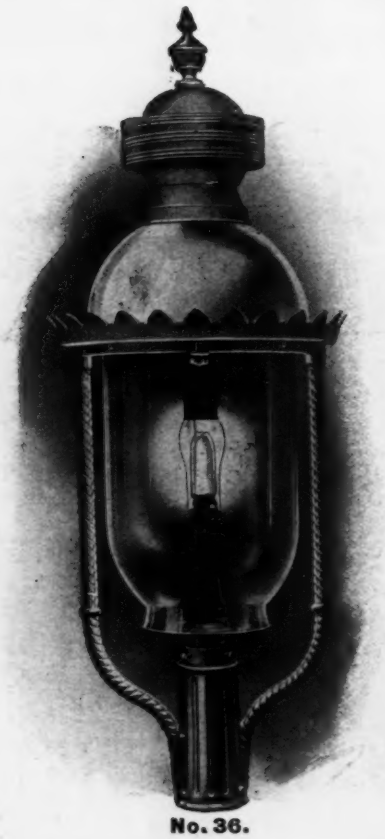

No. 36.

No. 38.

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Memphis, Tenn. (2d contract).	**Omaha, Neb.**	**Peekskill, N. Y.** (2d contract).
Council Bluffs, Ia. (2d contract).	**Muskegon, Mich.**	**Waterville, Me.**
Seattle, Wash. (2d contract).	**Nazareth, Pa.** (2d contract).	**Washington, D. C.** (3d contract).

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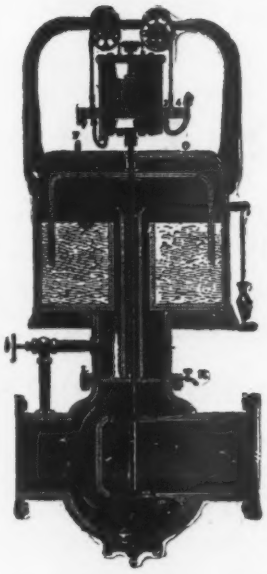

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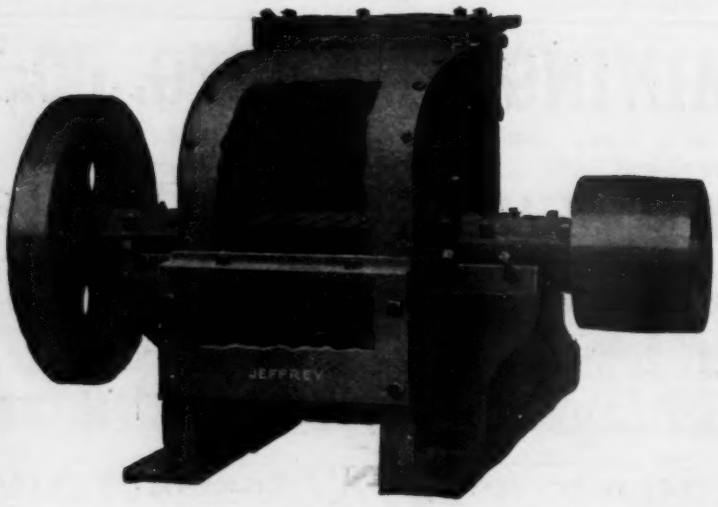

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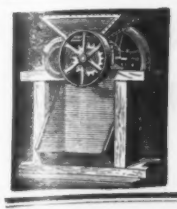

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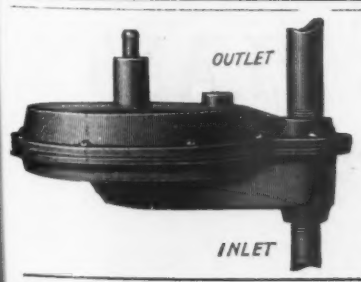

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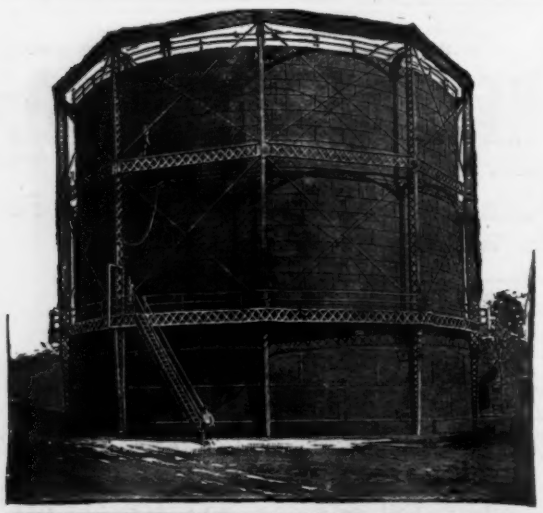

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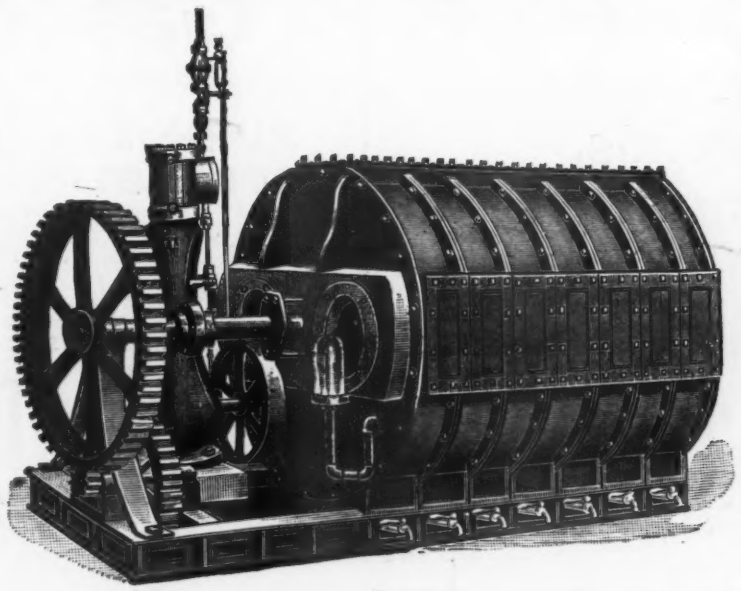

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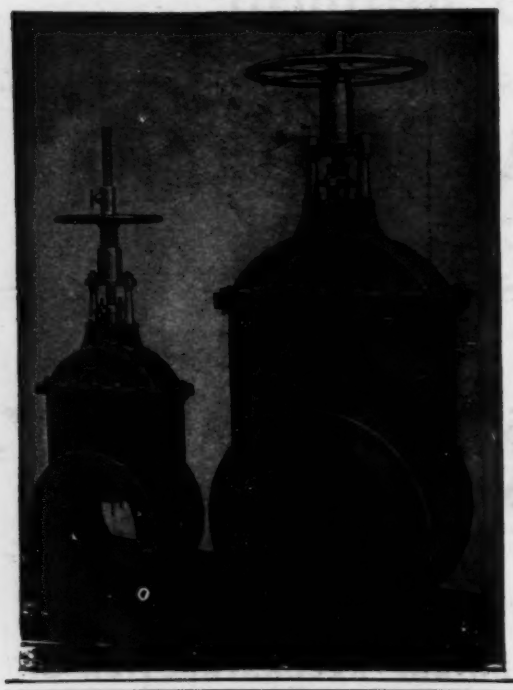

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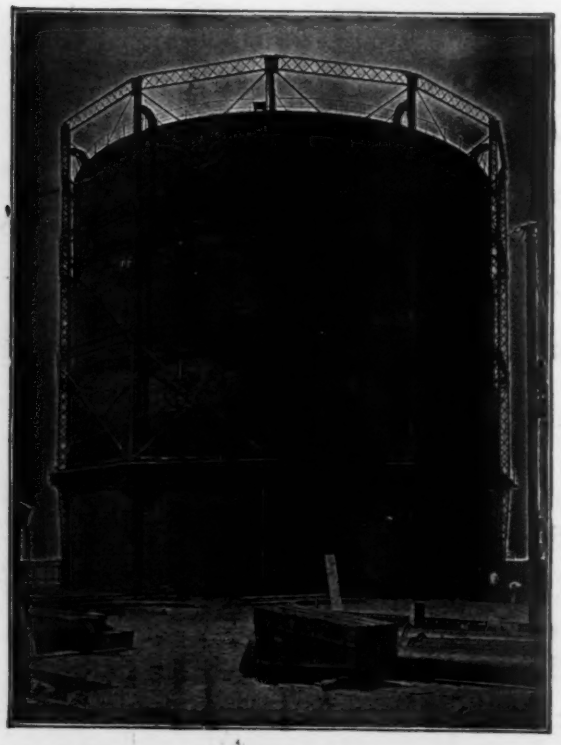

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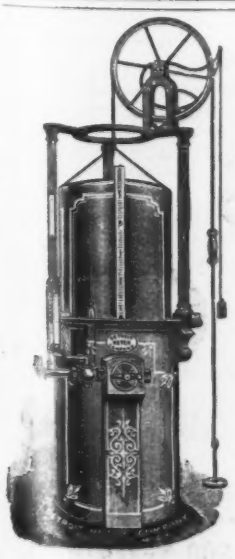

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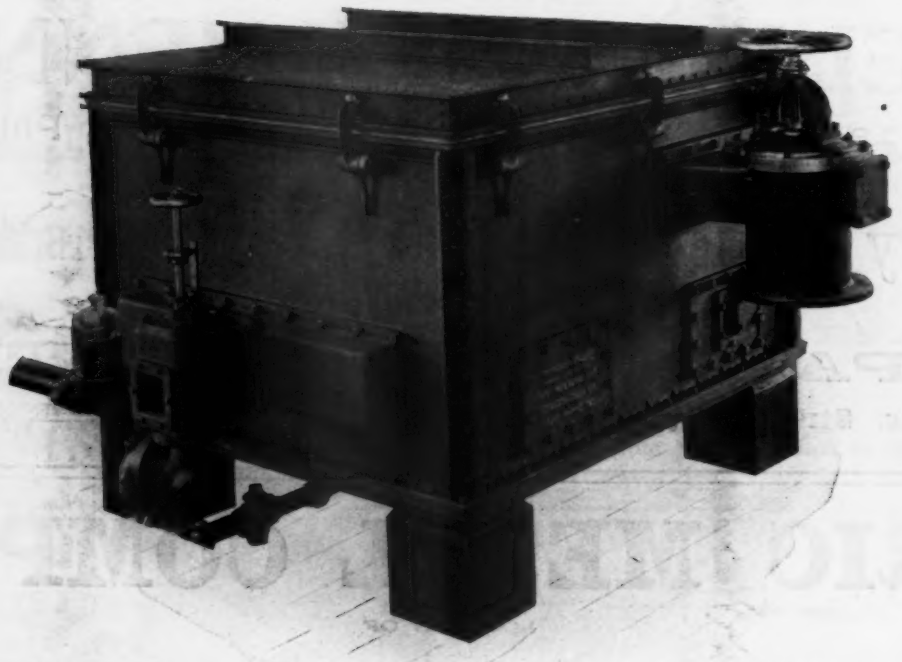

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